INDUSTRIAL-ARTS MAGAZINE

Incorporating: HANDICRAFT and the ARTS AND CRAFTS MAGAZINE

Published Monthly by

THE BRUCE PUBLISHING COMPANY, Milwaukee, Wis.

Established 1891

FRANK M. BRUCE, Publisher

W. J. LAKE, Eastern Advertising Manager — E. E. KRILL, Business Manager — H. KASTEN, Subscription Manager

OFFICES

MILWAUKEE: 129 MICHIGAN ST. — New York: 112 East 19th St. — Chicago: 64 W. Randolph St.

TABLE OF CONTENTS

Vol. VI — **NOVEMBER, 1917** — **No. 11**

Entered January 20, 1914, as second-class matter in the Postoffice at Milwaukee, Wis., under the Act of March 3, 1879. Member of the Associated Business Papers.

SUBSCRIPTION INFORMATION.

The subscription price of the *Magazine* is $1.50 per year, payable in advance. Postage for Canadian and Mexican subscriptions, 35 cents; for foreign countries, 50 cents. Single copies, not over six months old, 25 cents; more than six months old, 50 cents. Notice for discontinuance of subscriptions must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration, with full balance due to date. Notices for changes of address should invariably include the old as well as the new form of address. Complaints of non-receipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

EDITORIAL CONTRIBUTIONS.

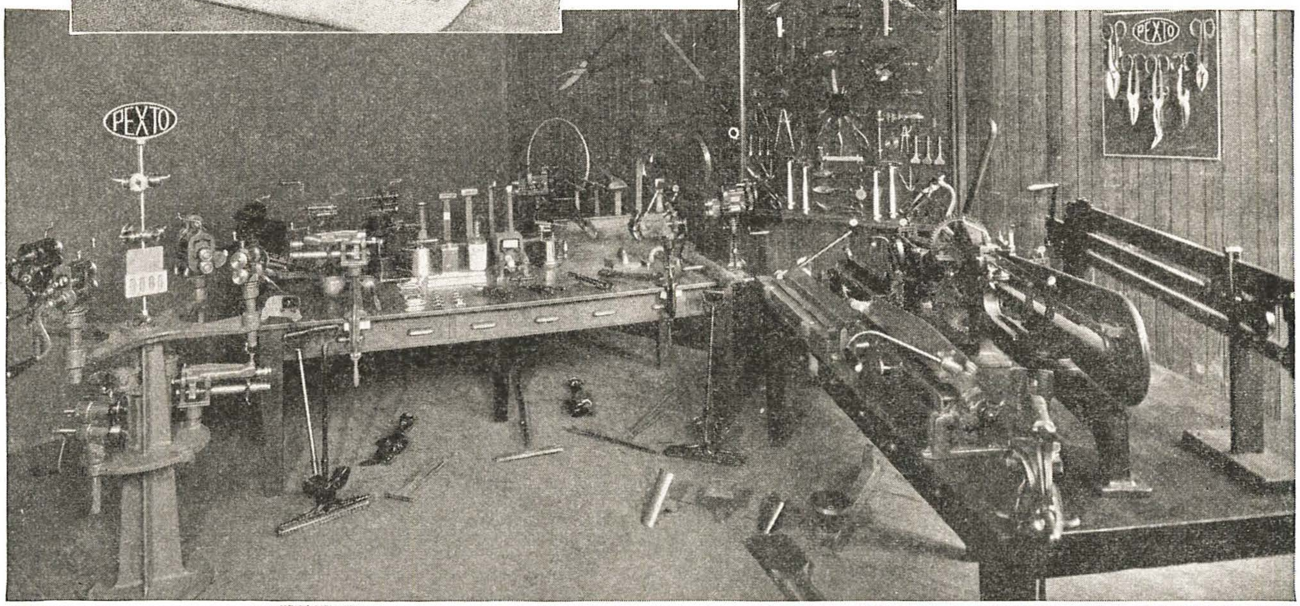
The Board of Editors invites contributions of all kinds bearing upon the Industrial-Arts Education, Manual Training, Art Instruction, Domestic Science, and related subjects. Unless otherwise arranged for, manuscripts, drawings, projects, news articles, etc., should be sent to the Publication Office in Milwaukee, where proper disposition will be made. The Board of Editors meets once or oftener each month in Chicago, and all contributions submitted are given careful attention. Contributions when accepted are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

The Industrial-Arts Magazine is on sale at Brentano's, 5th Ave. and 27th St., New York City; John Wanamaker, Market St., Philadelphia; A. C. McClurg & Co., 218 S. Wabash Ave., Chicago.

PEXTO TRAVELS PHILADELPHIA

PEXTO

Permanent Display of Pexto Machines and Tools for Sheet Metal Working at The Berger Brothers Company, Philadelphia, Pa.



How Technical Schools Meet War Demands

The unprecedented war demands for sheet metal workers in the country's largest industries has brought a corresponding demand upon the technical school. The need for sheet metal courses and equipment is now imperative.

Automobile, truck and aeroplane manufacturers, all struggling under the urgent demands of war, need trained men. Even after peace is declared this condition will be more acute. Restoration too will call for skilled sheet metal workers and student graduates.

The Berger Brothers Company of Philadelphia have prepared themselves for this emergency. This old established sheet metal house maintains a permanent and complete school display of Pexto Sheet Metal Workers' Machines and Tools. By supplying Pexto Equipment this growing concern is well qualified to meet the requirements of the schools.

You'll find a visit to this Philadelphia display most instructive and helpful. In case Philadelphia should not be a convenient point, let us direct you to the nearest Pexto display, probably in your own city.

Many Schools Now Pexto Equipped

Many of the country's largest technical institutions have added sheet metal working courses to the schools curriculum. Baltimore Polytechnic Institute, Carnegie Institute of Technology and Lathrop School of Kansas City are well known examples while many other technical schools in every part of the country have taken this important step. An ever increasing demand for graduate students is the great force back of this movement.

Let us send you further interesting facts about sheet metal working as a school course. Write today.

The Peck, Stow & Wilcox Co.

Mfrs. Mechanics' Hand Tools, Tinsmiths' and Sheet Metal Workers' Tools and Machines, Builders' and General Hardware.

Southington, Conn. **Cleveland, Ohio**

Address all correspondence to
204 *W. Center St., Southington, Conn.*

PEXTO

SHEET METAL WORKERS' MACHINES & TOOLS

INDUSTRIAL-ARTS MAGAZINE

Vol. VI NOVEMBER, 1917 No. 11

The Organization of Industrial Content Material

Leon Loyal Winslow, State Normal College, Bowling Green, Ohio

SOME thirty years ago manual training was introduced into the schools, at a time when handwork as a part of formal education was almost unknown, when industrial inefficiency upon the part of school-trained individuals was the rule. It was hailed as a panacea; its effectiveness was not then questioned by anyone; today its value as an all important means to industrial efficiency is questioned universally. Out of thirty years of trial, error, and success there has at last been evolved a logical conception of manual training and of its function in the curriculum. Briefly, the progressive steps in this evolution have been (1) The introduction of manual training as a form of disciplinary activity. (2) The elevating of manual training to the rank of a school study. (3) The consciousness that manual training did not produce efficient workers, thinking workers. (4) The conviction that manual training, being decidedly lacking in content values and therefore, in no way equal to other content studies, should no longer be entitled to recognition as a school subject. (5) A more serious contemplation of industry, with a view to providing a school study of maximum educational worth which should deal with industry as an organized body of human experience.

As we look back over this growth in the conception of a school study we wonder that advancement has been so slow. Industry from the first demanded of education that it be made industrial, not merely that it be made manual. The result of our inability to understand the demands made by industry has been that manual activities have flooded our schools; *manual* activities, activities specifically manual and decidedly unindustrial. School courses have been limited to one or two materials easily obtained and easily worked because shop teachers have persisted in holding fast to the old, exploded theory that the acquisition of skill should be the ultimate aim of all shop courses.

In a word, the selection of activities has been made upon the basis of the materials at hand rather than upon the industries. Whenever courses have been thus built about materials they have failed in that they have emphasized activities unduly and have thus made them ends in themselves rather than means to ends. In such courses tool processes have been the determining factor both as regards the choice of projects and their arrangement in the course.

Manual training courses in general have been void of thought producing material. The few simple tool operations required have been easily understood if not mastered by pupils who have been able to perform them with as much skill as could be expected in the time allowed. A mastery of specific tool operations in the common school is not essential. Content is essential.

What elementary schools need most today is not a period now and then devoted to manual training. It is, of course, true that pupils in the grades should have manual tasks to perform but this handwork need not be relegated to a period now and then devoted to manual work and there divested of a large part, if not all, of its original educative significance. What the elementary school does need worse than it needs this kind of manual training is a comprehensive course in industries.

In this paper general education only will be discussed. Vocational education is not our province. There is likely no such a thing as general vocational education. We shall keep this fact in mind. There is, however, a vast body of industrial content material with which all men and women of true culture should be familiar. This material is today being collected, organized, and evaluated, and it is gradually being crystallized into a new school study. What this study is called makes little difference. We choose to call it industrial arts. Prof. F. G. Bonser, of Columbia University, has defined industrial arts as the distilled experience of man in his adaptation of natural materials to his needs for creature comfort, to the end that he may more richly live his spiritual life. If we accept this definition and govern ourselves accordingly we shall provide for a school subject which will deal primarily with the industries, a study of industry from the social side as well as from the technical side, a cultural study of industry with the emphasis upon the how and why of industrial operations combined with a real appreciation of industrial life.

The industrial arts point of view accepted, we shall see that for the purpose of organization most of the drawing and construction work done in elementary schools will fall to the subject of industrial arts, not because industrial arts is a *manual* subject but rather because it is an *industrial* subject and because industry deals more with manual activities than do history or geography or arithmetic. As phases of school life drawing and manual training are at the disposal of all school studies, but the time has gone by when drawing and manual training should be regarded as subjects in the elementary school.

Let us now turn our attention to courses offered in schools above the elementary grade. It is a deplorable fact that work offered in the majority of our junior high schools is in no way typical of industrial life. It is just at this period that the student most needs a differentiated course; at this time vocational guidance should play an important part. It is unnecessary to restate the proposition that here especially content material has been lacking.

We contend that the shop should be a place for careful manual work; it should also be none the less a place for intellectual work. There are strong evidences that the conventional grammar school woodworking shop is undergoing a change; it is gradually being made over into a laboratory where many industries are studied and a great variety of materials employed. Intellectual and manual effort must go hand in hand, but above all industry must be made our first consideration. Activities will readily suggest themselves when content is given its proper place. There will undoubtedly be fewer projects in the courses offered but those remaining can at least be justified. More time will necessarily be demanded. If a worthwhile study is to be attempted two shop periods of 45 minutes each will not suffice. There should be seats provided in the shop or in a room adjoining where students may write, draw and figure at their ease.

As regards the range of material at the disposal of the teacher, the following will be found suggestive. (1) The manufacture of machinery for the production of power. (2) The manufacture of conveyances. (3) The manufacture of clay products. (4) The manufacture of glass. (5) The woodworking industries. (6) Contracting and building. (7) The manufacture of cements. (8) The manufacture of leather goods. (9) The manufacture of rubber goods. (10) The manufacture of paper. (11) Printing and publishing. (12) The manufacture of stains and paints. (13) The manufacture of soap. (14) The manufacture of textile fabrics. (15) The manufacture of clothing. (16) The preparation and preservation of foods.

The above list, in a general way, may be said to cover the industrial field. It is not recommended of course that any teacher should attempt to cover all of these industries in a given grade. There are factors which will influence his choice. Some industries will be found to be better suited to the interests and needs of the girls; others to those of boys. Some will be found especially appropriate to certain localities. But the fact that the industries are not to be approached with a view to vocational training should not be lost sight of.

The industry once decided upon, the class is put to work investigating it, collecting information from all the sources available. Much of the material will be obtained thru actual contact with those engaged in the industry or who handle its products. Some facts will have to be obtained from reference books. Pupils will also be able to collect information by writing to manufacturing concerns whose advertisements they see in the magazines and newspapers. The instructor should make assignments covering such topics as the following: (1) The value of the industry to men. (How we are affected by it.) (2) The evolution of the industry; its heroes of invention. (3) Characteristics of the product. (4) Analysis of the product. (5) Materials employed. (6) Processes involved. (7) Classification of processes as skilled and unskilled. (8) Healthfulness. (9) Hours and wages. (10) The training of workers. (11) The part played in the industry by mathematics. (12) The part played by drawing. (13) References to the industry found in literature. (14) The industry as depicted in art.

Projects illustrative of the industrial processes involved in the above study are arranged by the instructor who is careful to assign them as problems to be solved, each pupil being allowed to work out his own dimensions and quantitive measurements from the instructions given.

An outline for grades seven and eight in the subject of industrial arts should include a carefully arranged list of the industries to be taken up by the class during a definite period of time. The following will serve as an example, this outline providing for the study of five typical industrial units in grades seven and eight, the time allotted for the task being one full year.

OUTLINE FOR GRADES SEVEN AND EIGHT.

I. *The woodworking industries.*

Logging; saw-milling; carpentry; furniture manufacturing; the making of miscellaneous articles.

II. *Concrete construction.*

Portland cement manufacturing; factory construction; the building of bridges and culverts; the making of sidewalks and foundations; the making of ornamental concrete structures.

III. *Sheetmetal trades.*

Brass and copper working, including stamping; sheet iron construction; the manufacturing of aluminum ware.

IV. *Engine construction.*

Steam engines; internal combustion engines.

V. *The manufacture of electrical appliances.*

Generators; motors; telephone and telegraph apparatus; bells and annunciators; incandescent and arc lamps.

A discussion of the sub-topic, steam engines, classified in the above outline under IV, engine construction, will give an idea of the character of treatment given a specific unit of work and the organization of subject matter bearing upon it.

Steam Engines.

I. *Value to man.*

The world today accomplishes a vast amount of its work by means of machines which are operated largely by power produced thru the agency of steam. Steamboats and locomotives have opened up the remotest parts of the earth and have brought cities close together which but a century ago were separated by barriers then regarded as almost unsurmountable. By the aid of a steam engine one man is now able to accomplish, in some instances, the work of a thousand individuals in a given length of time. The revolution of industry by the steam engine has so cheapened commodities as to render many articles of commerce indispensable to all men which were formerly regarded as expensive luxuries by the few.

II. *Evolution of the industry.*

The invention and perfection of the steam engine has been accomplished thru the following discoveries: (1) that water when heated takes the form of steam; (2) that steam possesses the property of powerful and of definite expansion; (3) that when allowed to escape from a state of pressure sudden expansion of the steam cools it sufficiently to cause the recondensation of part of its substance, thus tending to create a vacuum.

The following stages in the evolution of the steam engine were realized thru an application of the above scientific facts. A Frenchman, Solomon de Caus, succeeded (1615) in forcing water contained in a copper ball thru a tube by applying heat. An Englishman, Thomas Savery, accomplished the same result by means of a machine in which the boiler was separate from the vessel in which the steam did its work. A knowledge of this principle led to the invention of a piston-engine in 1688, by the Frenchman, Dennis Papin. Papin's piston-engine was improved upon by Thomas Newcomen in England in 1705. Newcomen introduced the beam and made the condensation of steam an instantaneous process. In 1769 James Watt patented a separate condenser.

III. *Characteristics of the products.*

Types of steam engines.

1. Stationary machines for mills and power houses; for pumping, air compressing and hoisting.
2. Locomotive machines for locomotives, boats, road rollers and tractors.
3. Portable machines for farm use.

IV. *Analysis of the product.*

Definition: A steam engine is a motor in which the expansive force of steam is employed to transform the energy of heat into useful work.

The mechanism.

Parts.

1. Foundation or wh els.
2. Frame to support the mechanism.
3. Cylinder. Barrel-shaped casting. Bored out. Ends closed by cover-like castings called cylinder heads, which are bolted to the body. Opening for piston rod; openings, called ports, for steam and for exhaust. Valves for steam chest. Valve gear to open and close valves.
4. Piston—Flat circular disc with packing rings.
5. Piston rod—Attached to piston and cross head.
6. Cross head—Works in guides. Provides for the transforming of the direct motion of piston rod into the swaying motion of the connecting rod.
7. Connecting rod—At one end is a bearing for the cross head pin and at the other a bearing for the crankshaft.
8. Crank and crank shaft.
9. Fly wheel.
10. Governor—Balls and connecting arms.

V. *Materials employed.*

Cast iron, wrought iron, steel, wood, copper and brass.

VI. *Processes involved.*

1. Smelting and refining of ores.
2. Production of ingots.
3. Making of designs and drawings.
4. Estimating, planning and testing.
5. Making of patterns.
6. Making of castings.
7. Machining of parts.
8. Making of forgings.
9. Assembling.

VII. *Classification of processes as skilled and unskilled.*

Skilled—Smelting and refining of ores—chemists and foremen; drafting; estimating, planning and testing; forging by machine hammers and by hand; making of patterns; making of castings; machining of parts; skilled assembling and the inspection of assembled machines.

Unskilled—Laborers engaged in moving materials from place to place and inexperienced workers in the various processes named above, together with machine hands who are either incapable of doing skilled work, or who have not finished serving their apprenticeship.

VIII. *Healthfulness.*

The most prevalent industrial disease, tuberculosis, claims workers from all of the occupations connected with engine construction, but it is most common among the pattern makers, molders and grinders. Men engaged in the smelting and refining of ores and in the production of ingots are subject to rheumatism, bronchitis and digestive troubles, owing to exposure to the weather, excessive heat, and to the great variations of temperature occasioned by the handling of molten metal. Draftsmen as a class are well taken care of, altho the work is confining. The same may be said of the clerks and office force. Pattern makers are well provided for in plants where exhaust fans are furnished for carrying off the dust. The work of the machinist is undoubtedly the most healthful of the metal working trades. Machine shops are generally well lighted and are fairly well ventilated, while the use of oil in connection with all tool operations keeps down the dust. Blacksmiths are subject to chronic coughs and colds and to rheumatism and lumbago which are charged to fumes, noises, and the excessive light produced by the fires and by heated metal. The commonest complaint of boiler makers and of drop forge workers is impaired hearing.

Industrial diseases, in terms of the above occupations, can for the most part be done away with thru the following precautions: (1) Movable screens, asbestos furnace coverings, fans and air blasts, to prevent excessive heat. (2) Hoods connected with the stack, exhaust fans, etc., to prevent escaping fumes, smoke and dust from entering the air which is breathed by the workers. (3) Windows, skylights and more adequate artificial lights. (4) Elevated wooden floors or floors of concrete instead of dirt floors. (5) Respirators for those who clean castings or are otherwise compelled to breathe dust into their lungs. (6) Sanitary cuspidors to prevent the spreading of communicable diseases. (7) Medical inspection. (8) Drinking fountains which supply water at the proper temperature. (9) Adequate washing facilities, shower baths and toilets. (10) Goggles for those who work with fires and glowing metals. (11) Cotton for the ears of those who work at noisy trades.

IX and X. *Hours, wages, the training of workers.*

Machinery and engine construction offers such unusual opportunities for advancement that a greater number of ambitious boys are willing to submit to the low wages and the long periods of apprenticeship in this than in any other industry. The age of entering the industry varies from 16 to 21 years. The wages paid the beginner vary from $2.00 to $9.00 a week. The hours vary from eight to ten, altho a ten-hour day prevails. The training for the industry is usually obtained in the shops of the industry. At the end of a period of apprenticeship lasting from two to five years the apprentice becomes a worker of low grade skill. As such he is paid from $7.50 to $18.00 a week. Highly skilled adult workers are paid as follows: pattern shop, $15.00 to $28.00; foundry, $15.00 to $35.00; forge shop, $15.00 to $44.00; machine shop, $12.00 to $32.00; boiler shop, $13.50 to $30.00.

Most of the workers engaged in the manufacture of engines are merely machine hands tending one machine and turning out one kind of work. Chances for all-round training are not good, under these conditions, for the majority of the workers, altho they are excellent for a comparative few to become all-round machinists, blacksmiths, moulders, pattern makers and boiler makers. Most of these all-round machinists are employed in the repair shops. They are picked from among the most efficient of the machine hands and helpers.

XI. *Mathematics involved.*

Mathematics figures largely in the work of the draftsman; the chemist; the man who estimates, plans, and tests materials; and the foreman in the various departments. It does not figure largely in the work of the skilled and unskilled mechanic.

XII. *Drawing involved.*

Drawing is involved mainly in the drafting department altho some knowledge of the representation of form is of value to men engaged in the trades. A knowledge of mechanical representation is essential to all the workers with the possible exception of those engaged in smelting and refining and in the production of ingots.

XIII. *Project. The making of a steam engine.**

It is assumed that this work is to be done in the usual school shop which is equipped for woodworking only. The

following additional equipment will be necessary: bench drill and drills of carbon steel, 1-16″, $\frac{1}{8}$″, 3-16″ and $\frac{1}{4}$″; tinners' snips; side cutting pliers; soldering equipment, including soldering iron and gas forge for heating same and with an arrangement for melting lead; melting pot; molding flask, to be constructed by students; hack saw and blades, flat files.

In the construction of an engine the various parts are made with a view to maintaining their appropriate functions, altho in many cases materials other than those employed in industrial practice will be substituted. Thus students are allowed to use lead in the making of castings because facilities for melting lead are available, whereas it would be impossible to melt iron.

The process of casting, however, is well illustrated by the use of lead. Where industrial practice would call for the use of steel in construction, wrought iron will be substituted. Other substitutions may also be justified in so far as the function of the part is maintained.

Order of Procedure.

1. Make the cylinder of tubing.
2. Cast the piston embedding nail as piston rod.
3. Cast cylinder head on the cross head end of cylinder.
4. Drill hole in center of cylinder head for piston rod.
5. Place piston in position in the cylinder with piston rod extending thru the hole in cylinder head.
6. Flatten end of piston rod and drill hole in flattened end for connection with cross head.
7. Cast cylinder head on opposite end of cylinder.
8. Cast base of steam chest.
9. Drill holes for ports in steam chest base.
10. File top of steam chest base absolutely flat and smooth.
11. Cast D slide valve.
12. File bottom of D slide valve absolutely flat and smooth.
13. Cast steam chest.
14. Drill hole for valve stem in cross head end of steam chest.
15. Place D slide valve in position with valve stem extending thru hole in wall of steam chest.
16. Flatten end of valve stem and drill hole for connection with valve gear.
17. Solder steam chest to the base prepared in step 8.
18. Drill hole in top of steam chest for steam inlet pipe.
19. Make inlet pipe of tubing.
20. Solder inlet pipe in place.
21. Make cross head guides.
22. Make connecting rod.
23. Cast fly wheel.
24. Make shaft.
25. Cast crank wheel.
26. Make crank pin and other pins.
27. Make bearings for flywheel.
28. Make lever for valve gear.
29. Assemble entire engine.
30. Mount on concrete base.
31. Finish all excepting working parts with enamel paint.

*These directions were formulated by Prof. A. P. Gompf, of the State Normal College, Bowling Green, Ohio.

The above outline is suggestive only, of the opportunities for organization at the disposal of shop teachers working in such junior high schools as are considered a part of the general educational scheme. It is hoped that the preparation of other outlines intended to cover the remaining industries will lead to a greater efficiency in the teaching of industrial arts.

HANDWORK well taught to boys and girls is of definite help towards making intelligent, clearminded citizens full of appreciation and right attitudes.

Handwork well taught requires or develops a full knowledge of the subject-matter to be expressed, a rich imagination and clear, logical constructive thinking.

Handwork well taught is a definite expression of beauty in terms of right material rightly used, fine color, fine proportion and fine construction.

The above working ideal for elementary teachers in manual training was prepared by two students of Miss Anna E. Swainson, in the manual training department, of the Los Angeles State Normal School.

DRAWING IN THE HIGH SCHOOL

Beatrice Cannon, Chicago

(First Article)

AN INTRODUCTION.

THIS series of papers has been prepared by one engaged in teaching high school drawing, and who is one of the many trying to find the most effective way of working under present rather confusing conditions. During the last few years drawing has been coming into its own in the secondary schools; its practical values in many very different directions are generally recognized and practical results are expected. In the face of increased responsibilities and demands, the high school finds itself handicapped by the fact that the standard of attainment in many elementary school systems is a very variable quantity; and a more uniform standard is imperative in fairness to the pupil. Even in so large a system as that of Chicago, for instance, it has been possible until very recently for a child to enter high school without having had instruction in drawing since the fifth grade. The pupils were encouraged to take it, yet in the crowded curriculum some substitution of unrelated subjects was permitted. The result of this was that sometimes a large proportion of the entering class in high school was far behind others and was a drag on the general progress. I have been led to believe that similar conditions exist elsewhere; and that even when the subject cannot be omitted, there is a lack of definite standards, and neither teacher nor pupil is quite sure of the ground to be covered.

Thus, many boards of education are requiring results without providing the things necessary for the results. They have realized the demand for a certain standard in the output of the high schools, without recognizing that in order to reach this standard in the way most economical of the pupil's time and of the expenditure of public money, we must begin at the beginning. The greatest service that can be rendered to this department of work is that supervisors shall establish a definite standard, possible of attainment in the grades, and that boards of education shall remove present obstacles to its accomplishment.

Added to these facts we often meet two unfortunate attitudes toward freehand drawing and design among the students themselves: (a) The idea that "talent" is necessary for any success worth while; (b) That these things are mere accomplishments without solid and practical value. These notions must be dislodged or transformed before we can hope to make our teaching efficient.

Overcoming Difficulties.

These articles suggest the following means of doing this: (a) by the choice of problems in both drawing and design which are definite, concrete, practical and systematically progressive; (b) by methods of working out the problems which are entirely within the grasp of the pupil at all stages, also definite, concrete, and practical.

Those pupils who are the victims of the first error are apt to avoid the drawing classes altogether if possible. If they cannot, they will mechanically try to do something which will satisfy the teacher, but all the while in the grip of a discouraging conviction that they can never learn to draw, nor reach a plane of real appreciation.

High-school boys are more apt than girls to assume that this work is an idle accomplishment, having been led to associate it with the fine arts to the exclusion of its industrial and other practical uses. A short time ago a boy in a beginning freehand class in high school observed his teacher marking some mechanical drawing sheets and approached with much interest. After studying them for some time he remarked emphatically, "There's use to that! Why don't we all do that instead of freehand?" The mechanical work appealed to a practical instinct in him, which as yet the freehand had not touched. He was shown some freehand drawings for practical shopwork, perspective and details of cabinet, machine, and architectural work, with some explanation of the value of this sort of skill to the practical workman. This was, of course, only one of many practical values that might have been shown, but it was one that made a direct and immediate appeal to him.

I recall at this point an instance which I have sometimes cited to boys, of a young man employed in the offices of a large firm. His duties were largely the supervision of clerical work and management of the firm's advertising. A number of times he added to his value to his employers by devising practical filing cases for certain materials, successfully planned to meet the exact needs and to fit the available office space; executing all necessary drawings from which the workman made the furniture. It is difficult to say how much this ability to handle spaces effectively had to do with his increasing supervision of the advertising. Such instances will often save the young people with their vital urge toward the practical from the mistake of indifference to freehand drawing.

Mistakes of Method.

Erroneous ideas have largely grown out of the fact that our drawing work is often too indefinite to take any vital hold on the young mind just growing eagerly independent. In his other classes he finds a definite problem set, the difficulties to be overcome clearly put before him; and when he accomplishes his task *he knows what he has done,* and how to solve a similar problem. Why should not the drawing be conducted on the same businesslike basis? If a

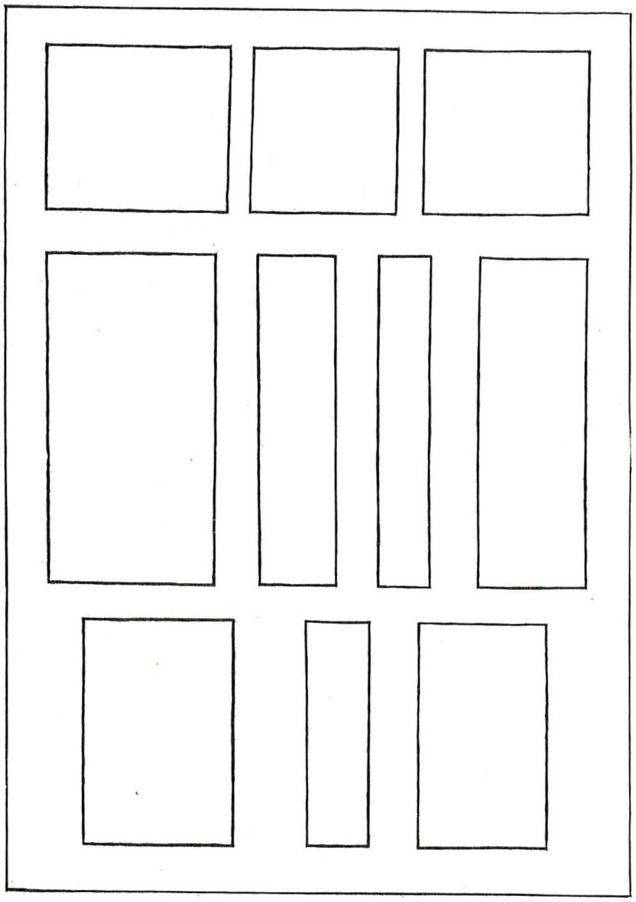


PLATE I

definite goal is set before him in such a way that he is made to grasp the main steps to it, as entirely possible of his attainment, and also as desirable from a practical as well as an aesthetic point of view, he will approach this work as willingly and as thoughtfully as any other. He must be made to understand that learning to draw is no more mysterious than learning to write, and is just as practical a possession. In referring to this, Mr. Frederic Law Olmsted makes an interesting comparison between language and drawing. He says in substance that the study of written language eventually leads a very small minority to produce literary masterpieces; it leads a great many to enjoy them; and all to make an humbler practical use of their knowledge in the affairs of daily life; and after all, the part of this that the school can do for the pupil, is to put the tool into his hand, train him to use it as it may be possible, and leave the individual to work out for himself whatever he can.

Mr. Olmsted further says, "Drawing it seems to me should be taught in this same way. If the pupil can be made to regard it in the way he does writing, as a laboriously acquired but commonplace means of expression, or recording facts, and testing the accuracy of his observation and the correctness of his knowledge, he will be in a good position to use it both in practical affairs of life and in developing his enjoyment of beauty wherever he sees it."

Because of a desire to foster "feeling," to give greater freedom to individual expression, teachers often withhold definite instructions in the fundamentals of drawing, which after all, are the solid foundation for whatever superstructure may be built.

So I plead for definiteness of problem, for practical application of design, and for the use of drawing in connection with other interests and activities as far as possible. And thru this method the chance of increasing the appreciation of beauty is not less, but greater. In laboring for this useful and practical power, the student will gradually find himself growing into an increasing understanding of the beauty about him in nature and in art, and as this aesthetic self becomes more and more consciously active, there comes surely the demand for beauty in personal surroundings, and in things of daily use. And this is one of the greatest services we can render them, to make them sensitive to the beauty of very simple and familiar things; to cause them to see that the elaborate decoration for which they and those about them often pay far too much, is infinitely less beautiful than the objects of good material and fine structure with no decoration whatever.

If we are, however, to reach these ends, we need to co-operate all along the line, the elementary school working toward a certain definite goal; the high school, sure of this foundation, taking further steps not tentatively but certainly; and in turn sending into technical schools and shops, or out into general activities, students of whom certain definite things may be expected. Sometimes we fail to appreciate

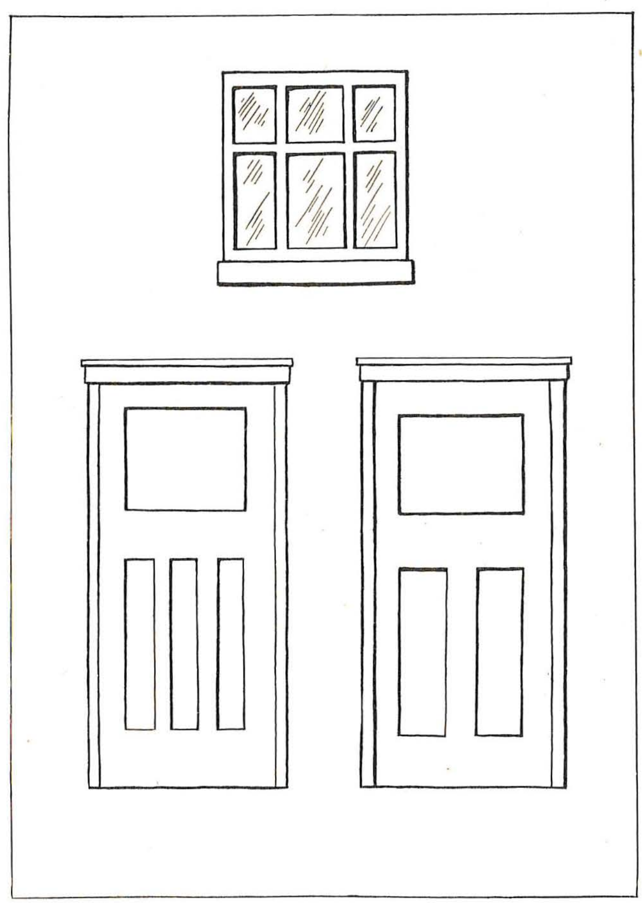


PLATE II

the significance of the general recognition that educators are giving to the practical and educational values of the graphic and manual arts. High schools are increasing the number of credits allowed toward graduation for this sort of work, in some cases five out of the sixteen or seventeen total requirement; and the universities are growing more generous. These things indicate very strongly the increasing need in this direction and the demand that all such instruction be given in practical and usable form.

Elementary Work.

The pupil entering high school should be as definitely grounded in drawing as in any other subject. He should already have had much experience in drawing both as pure representation and as illustration; and should, therefore, have acquired considerable readiness with several media. He should be able to draw with ease a few typical plant and animal forms, and simple curved and rectilinear objects. His experiences with color should have been arranged with systematic progression; so that in the high school he might begin with the study of color harmonies, not pausing for a survey of the whole field of elementary color as is at present necessary. He should have a practical working knowledge of perspective and of elementary design, tho little or no theory. I believe that the high school is the place where most of the technical side of the study should be developed; as, building on the free and stimulating experience of the grades, such theory and acquaintance with technique as may be desirable can be logically added.

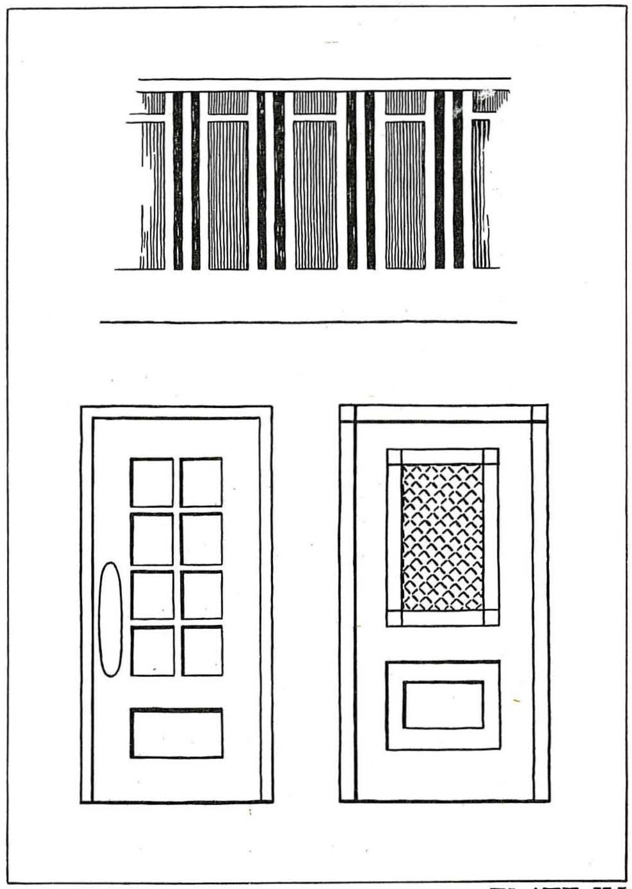


PLATE IV

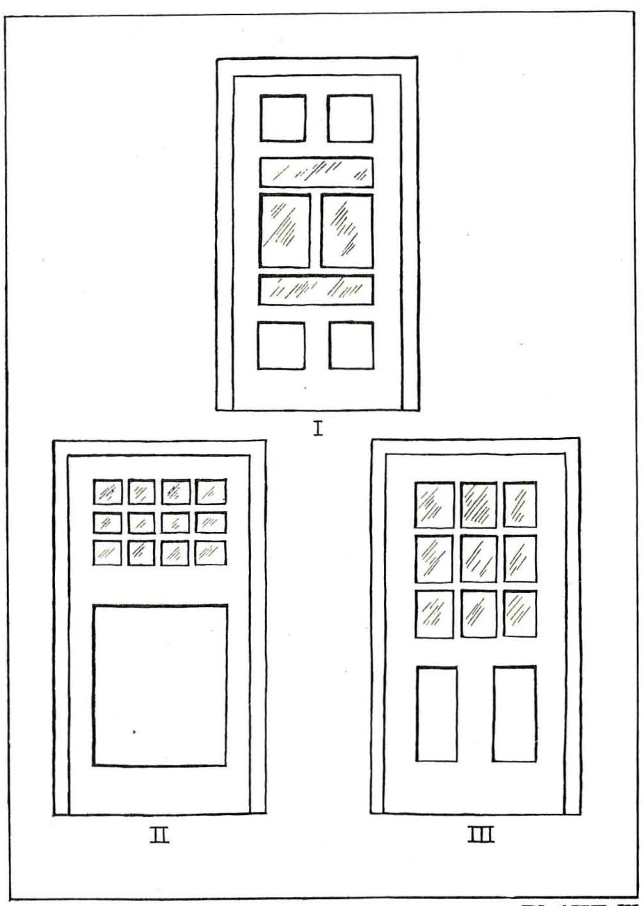


PLATE III

Fig. I. Door of Schoolroom. Bad Spacing. Figs. II and III. Corrections by Pupils.

Moreover, if the constructive side has been carefully trained in the grade work, then the more advanced problems of design and craft work in the high school will be of much greater value to the pupil, for he will be already accustomed to a given set of conditions. I do not think that it greatly matters what form the construction or craft work takes, as its chief value is the setting of definite conditions, which guide the child in design. If this has been done, he will accommodate himself easily to another set of limitations. There is, however, the fact that modeling greatly aids the perception of form, hence increases the power of solidity in drawing and strengthens the appreciation of line and should, therefore, be included in the elementary school wherever possible.

High School Work.

With this as a basis, the pupil should leave the high school with the following attainments: (a) Ability to make simple drawings of ordinary, familiar objects (furniture, buildings, plants, etc.), as easily and as much a matter of course as he could write their names and descriptions. (b) An equal understanding of simple working drawings and elementary pattern-making. (c) A general familiarity with the world's great artists, not only of brush and chisel, but architects and craftsmen, just as he has come into some acquaintance with the literary masters of his language. (d) Last and greatest he should develop

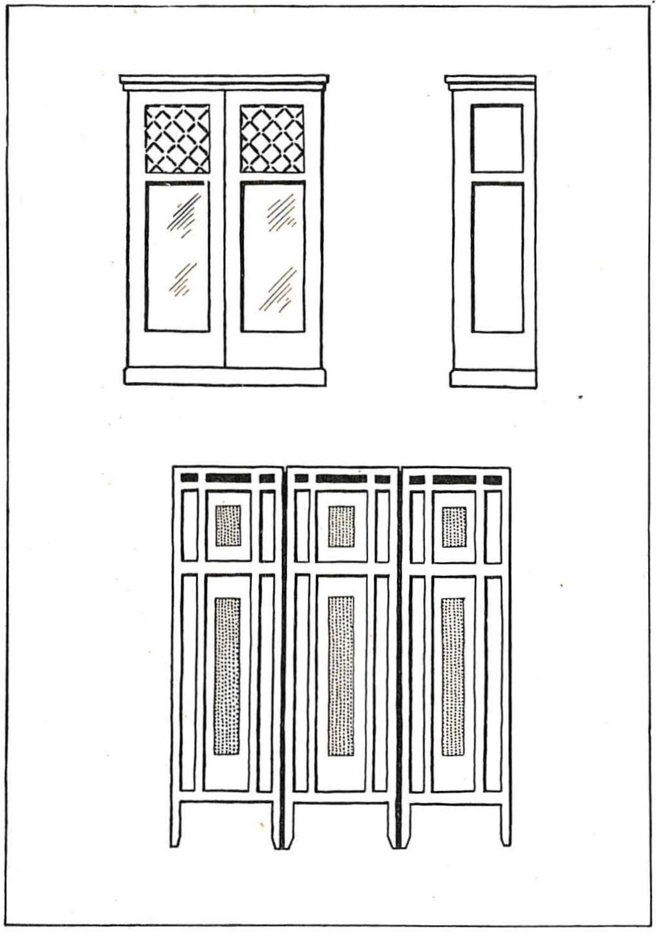


PLATE V

GOOD ARRANGEMENT OR SPACING.

First Essential in Design or Pictorial Composition.

Reason for This Kind of Study.

The essential requirements in any product of the artist or artisan are, first, that proportions shall be suitable for use, and second, that they shall be satisfying to the eye. Since there are proportions which are usually pleasing and others which are distinctly not so, it is well at the very outset of work with a class, to lead them to recognize the difference.

It is not well to supply them with any definite rule of measurement, as that leads most of them to its immediate adoption without further thought, and this is fatal to the end we have in view; namely, to induce the exercise of a definite act of judgment and choice each time the space is to be used, either for a freehand drawing or for any problem in design or construction. The pupil must be each time responsible for the appropriateness of the space chosen. All powers grow stronger with use and the aesthetic faculties are no exception. Furthermore, it is easier to obtain good results without resorting to mechanical rules for proportion than might at first be supposed; one or two class experiments will show that the majority choose good proportions once they are made to definitely consider the matter. Since most of our drawing is on paper of rectangular shape, and many of their craft and industrial problems involve special attention to this form, an exercise in choosing

thru continual and systematic exercise of his aesthetic powers, a kind of taste which will save him from being content with that which is really meagre and commonplace in his surroundings and will lead him to appreciate the intrinsic beauty in much that had before seemed commonplace. Taste should be sufficiently developed to enable him to look at pictures with genuine aesthetic pleasure; not depending upon the story telling or other elements for his interest, but with some real response to their beauty of color, pattern, line, etc.; and further to render him responsive to these same forces in nature. If this is accomplished it follows as a matter of course that his home surroundings will be more artistic.

Insofar as specific problems are introduced into these papers, they are set forth as concrete efforts made to meet conditions arising in the first and second years of the high school where the greatest difficulties now arise. They are here offered with the hope that they may have some definite suggestive value in meeting existing conditions. Much of what is set forth in the following pages would, under better conditions, be accomplished in the upper grades; but at present it is necessary to deal with it in the high school. The illustrations used are drawn almost entirely from the regular classwork of high school students.

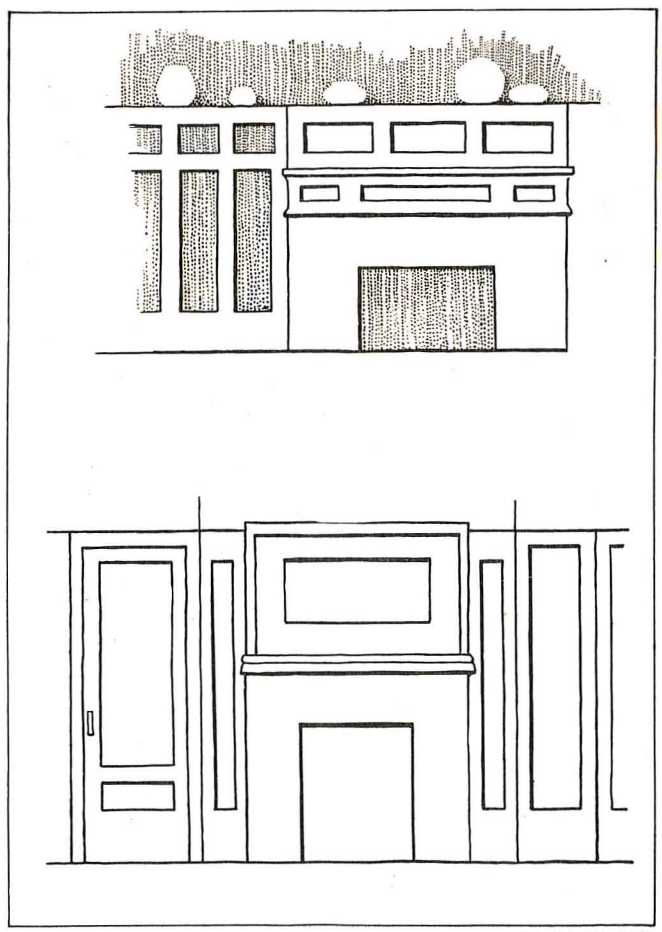


PLATE VI

good rectangles is valuable. A collection of such shapes may be drawn on the board from anything in sight—doors, door panels, window panes, table tops, books, etc.—and the class be asked to consider them and to classify them as pleasing or otherwise, thinking of them as abstract shapes or as spaces for pictures or decorative composition. (See Plate I.) The unsatisfactory ones they may be set to alter, and they will be found to do it quite readily. They reach the conclusion that those approaching a square, or those of much attenuated shape, are not so pleasing; while between the two extremes there are a number reasonably satisfying.

I have found this is a good preliminary exercise as it saves the pupil from too much experimenting with compositions in awkward and difficult spaces, and it is usually an encouraging surprise to them to find that a choice of this sort does not demand any peculiar insight, but merely such an exercise of observation and judgment as they are constantly called upon to use in many other ways. Further practice of this sort will speedily make them much more discriminating, and sensitive to the effect of even slight changes in proportion.

The following problems were used as a means of giving such practice. Each pupil made a page of experiments in designing rectangular shapes of good proportion, and checked two or three on his page as the most satisfactory to him. Later he referred to this page in choosing shapes most suitable for special compositions.

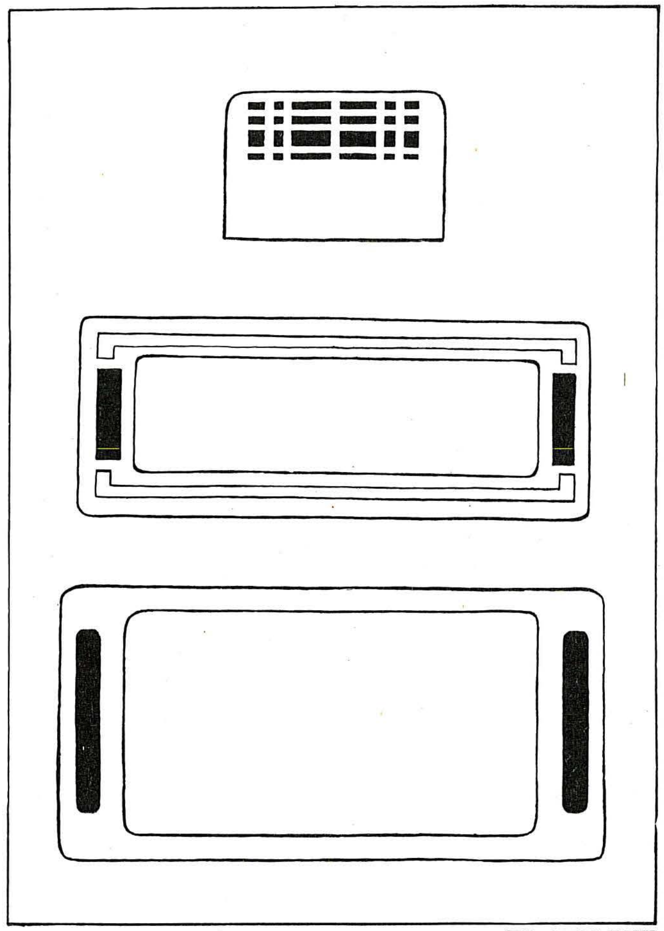


PLATE VIII

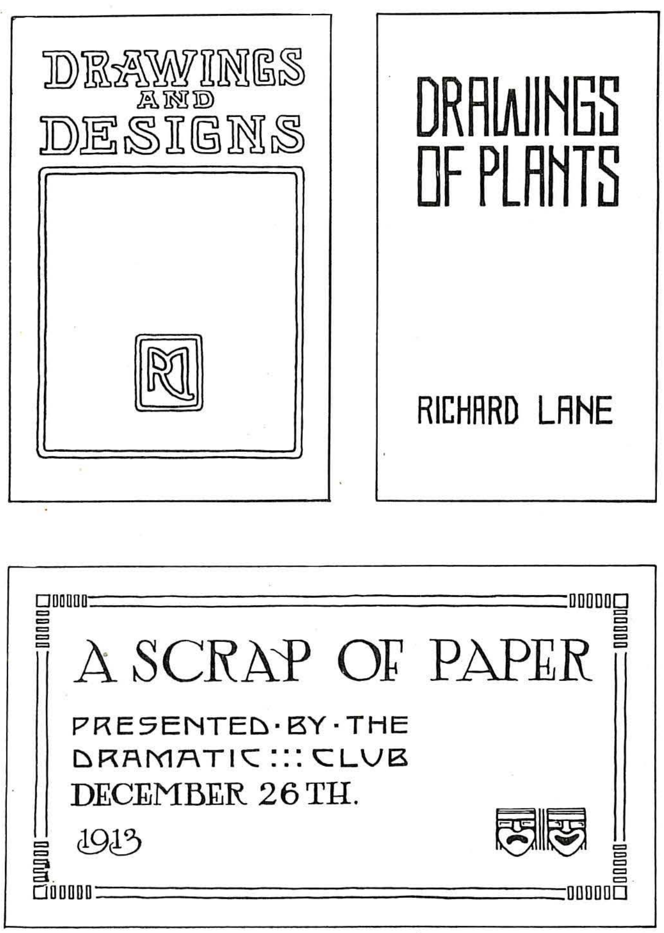


PLATE VII

There followed several problems involving arrangements of rectangular forms within these spaces:

(a) Door or window; rectangular space broken by panels or panes. (See Plate 2.)

(b) Balcony and stairway arrangements. (See Plates 4 and 9.)

(c) Arrangement of wall spaces broken by windows, doors, plate rails, etc. (See Plate 6.)

(d) Rectangular trays, wooden or metal. (See Plate 8.)

(e) Furniture problems. (See Plate 5.)

(f) Page arrangements, involving shape and placing of printed space, decorative panels, head and tail pieces, or intitial letters. Also book labels and advertising problems. (See Plate 7.)

Related problems may be multiplied but these are sufficiently suggestive. An exercise giving something wrong to be set right is a valuable experience to them. I once had the good or ill fortune to have a door opening from the classroom which was an example of bad spacing, and at this point in the work the class was unanimous in so judging it. They were asked to make a drawing of the door with rearrangement of the glass and wooden panels. Plate 3, Fig. 1, shows the original door while Figs. 2 and 3 are examples of their corrections. Emphasis must be placed on the necessity of keeping the entire space a

A B C D E F G H
I J K L M N O P
Q R S T U V W X
Y Z 1 2 3 4 5 6
7 8 9 0
a b c d e f
g h i j k l
m n o p q r
s t u v w x y z

PLATE X

A B C D E F G H I K L
M N O P Q R S T V
X Y Z
A B C D E F G H I
J K L M N O P T
Q R V S W X Y Z

MANUAL
TRAINING
EXHIBIT

ROOM 27

PLATE XI

pleasing unit, on keeping the arrangement of shapes within harmony with the whole; on the constant recognition of structural limitations, that is of lines which are horizontal and vertical as opposed to oblique, and on angles which are right angles as opposed to acute. Variety must be introduced without confusion; ill considered variety produces the confusion as evident in Fig. 1, Plate 3.

Incidental Study of Architecture and Lettering.

As so many good examples of fine spacing are furnished by architecture, this is a good place to introduce that subject. So strong is the classic influence among us, that in any town or city one may find examples closely related to Greek styles in either general plan or in details. These children may be made to observe and connect with such classic examples of Greek architecture as can be supplied by pictures in the classroom. The fine proportions and details of the Parthenon and other Greek temples will command their interested attention much more readily if they have connected it with something they see in their daily walk to school or on occasional trips about the city. If there is a public building accessible to them so much the better, but certain details such as porticos, columns, cornices, will suffice to form the connection.

PLATE XII

I have found that they easily develop much interest in the architecture about them and bring pictures for class use, many of them using their kodaks to collect specimens. They readily found examples of the Doric, Ionic and Corinthian columns, and a number of Greek treatments of cornices and friezes. Thus they also discovered many incongruities in the modern use of these details, and arrived at some appreciation of consistency of style.

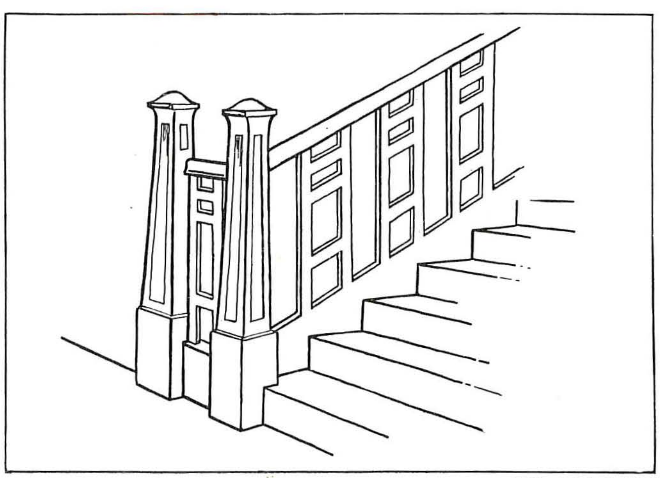


PLATE IX

From time to time their work will require special consideration of such problems of arrangement as are discussed here; and each time the opportunity should be taken to acquaint them with some architectural style, leading from a familiar local example to some fine specimen even if only accessible thru photographs.

Exercises requiring lettering are especially interesting and practical, and in the ordinary general high school where the time is usually so limited, I should make the teaching of lettering in freehand classes incidental. Each half year a standard alphabet can be adopted for class use, and all portfolios, posters and signatures required in that style or some

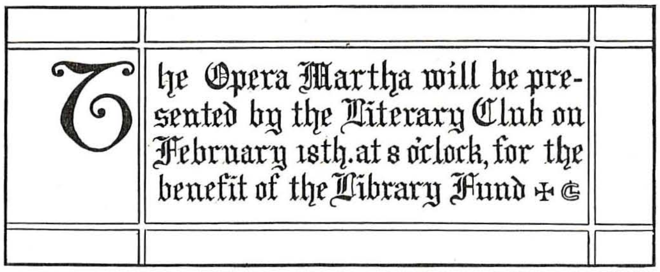


PLATE XIII

adaptation to suit special needs. In the third and fourth years they should be encouraged to design letters on the basis of these types. Some of this work can be done with brush or lettering pen or pencil as the special use shall make desirable or time permit. (Plates 10, 11, 12 and 13.)

After these exercises or similar ones, it seems to me that each pupil will have a definite and conscious gain, no matter what his particular interest may be; shopwork or commercial art, or household decoration where manifold problems of arrangement present themselves; while the more abstractly aesthetic interest of picture making and decorative design would receive a tangible basis for beginning. Each discussion of this topic will culminate in some practical application of these principles, preferably in shop or craft work.

PERIOD STYLES IN FURNITURE

Conrad Weiffenbach and Anton Anderson

(Fourth Article)

ONE of the problems that confronts the wide-awake manual training teacher is the selection of a suitable project, the design and construction of which shall embody educational as well as utilitarian features. Time was when the mission, or straight-line, projects were the only ones considered for school instruction. However, times, customs, and demands have changed, and in order to meet these present-day demands, teachers everywhere are changing their projects to conform with the latest and best in commercial practice. Mission furniture with its straightforward and simple construction is used principally in bungalows, dens, and clubrooms, whereas, the period styles in furniture have come to meet the ideas of modern architects to furnish rooms in "William and Mary," "Queen Anne," "Adam," "Sheraton," and other period styles. The serving table, illustrated herewith, is a popular selection in most woodworking classes, and it complies with the essentials mentioned. It is educational in that it has a distinctive style—the history and development of which was described in the June and July numbers of *The Industrial-Arts Magazine*. It is useful, first, as a serving table in a dining-room, and secondly, with its "low-back" removed, it may be used as a side table in a hall, library, or living-room. It is a good project for the high-school student, or amateur craftsman, because it involves many of the principles of the cabinet-maker's art. The types of construction include doweling, mitering, rabbetting, dadoing, dovetailing, etc. The design involves some of the strongest features of the "William and Mary" style.

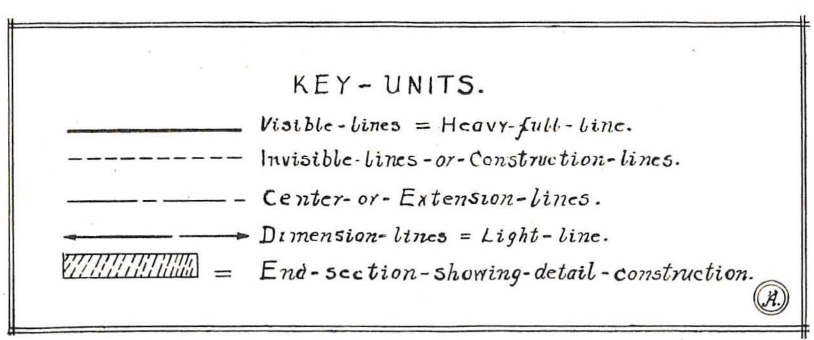
Since the school shop is the only place where the young woodworker may learn to execute a project, beginning with the drawing of the design and carrying it thru the successive stages to the final rubbing of the varnish, it is well for the teacher of cabinet making to acquaint himself with modern designs and methods of construction in order to keep abreast of the times. Our country needs more skilled workmen, and it is left for the teachers of industrial subjects to do their bit toward supplying this need.

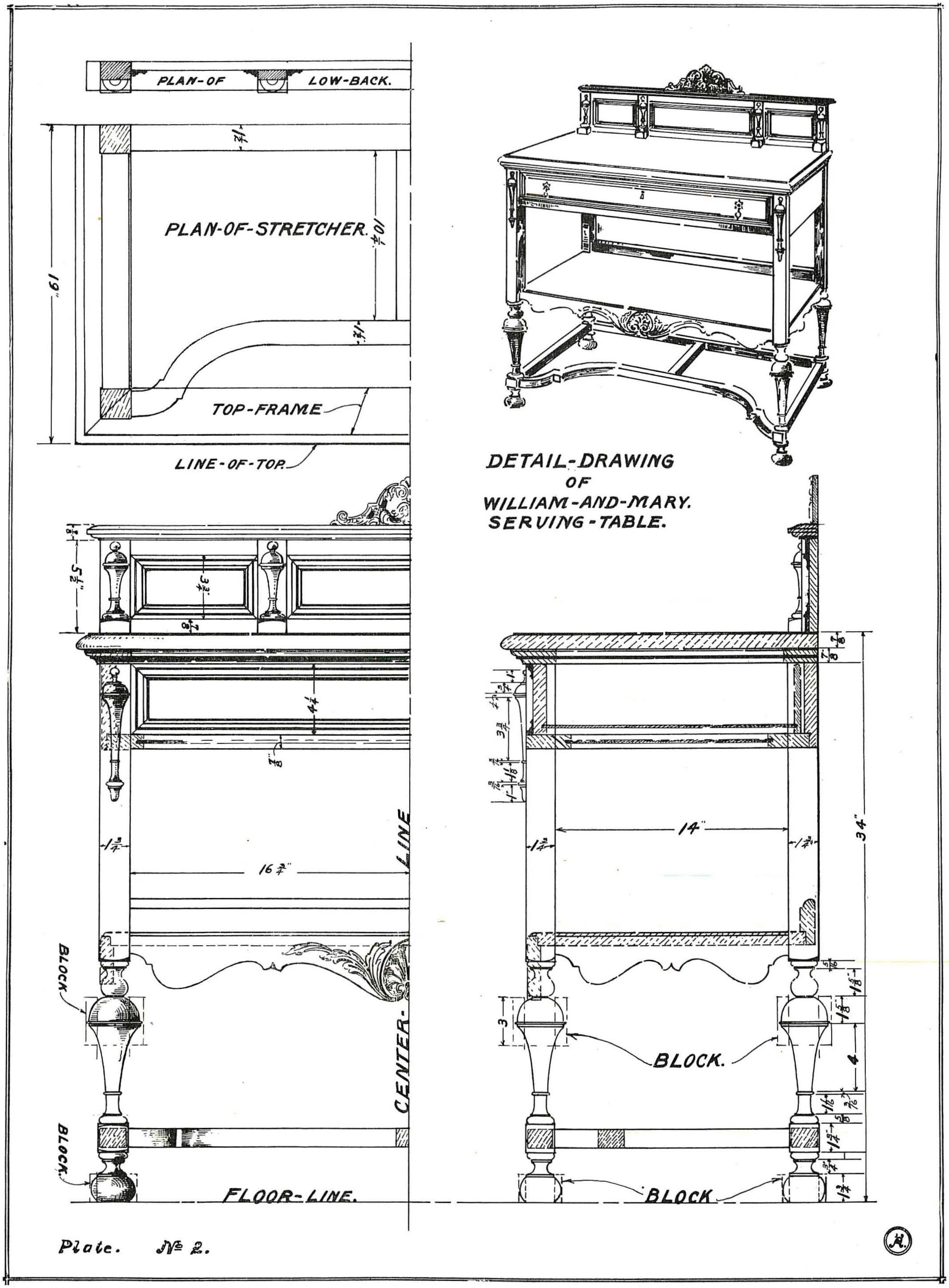
It is necessary in this case, to make a full size drawing showing three views as illustrated in the scale drawing, because of the turning and band-sawing required. For a better understanding of the lines and construction, reference may be made to the key units. It is good practice to make a perspective sketch as shown so as to give the student a clearer idea of what is required.

Begin by drawing the center line as shown, then the front elevation. This should include the full height, half the length, patterns of turnings, carvings, band-sawn base rail, stretcher, exact location of moldings on drawer fronts, top, top frame, low-back, ornamentation, sections showing construction.

The top view, or plan, may be made by carrying the lines up from the front elevation. It should include the full depth and half the length of top, mitered top frame, exact location of legs, plan of stretcher and intersections. The depth of plan is governed by the particular style. In this case it is nineteen inches. In order to avoid confusion, it is well to draw a separate plan of the low-back as shown.

Draw the side, or end elevation to the right of the plate as shown. This is necessary in order to




PLAN-OF LOW-BACK.
PLAN-OF-STRETCHER.
TOP-FRAME
LINE-OF-TOP.
19"
DETAIL-DRAWING
OF
WILLIAM-AND-MARY.
SERVING-TABLE.
CENTER-LINE
16 3/4"
14"
34"
BLOCK
BLOCK.
FLOOR-LINE.
Plate. № 2.

show more of the construction, such as the shape of the back legs, the construction of the drawer, frames, the low-back including full height, the position of stretcher, the band-sawn pattern of the base end rail and intersection with the shelf, the intersection of the front and back base rails with the shelf. It should also show the full height, and full depth of the table, and the thickness of all parts.

rough sketches and remarks, and the kinds of material used.

Get out all material called for in the stock bill, allowing the customary one-inch in length, and one-quarter-inch in width for each joint, and each separate piece. For example: the top is 19″ by 40″, and we wish to use five pieces. It will be necessary to cut five pieces 41″ by 4″. This will make four joints

ITEM-No.	No.-OF-Peises	NAME-OF-STOCK.	Lenght.	Width.	Thickness.	Stock-to-be-used.	Remarks.	Kind-of-Material.
1	1	Top carving	10	3	3/8	1	Glue-on-carving.	Qt-Oak.
2	1	" " see-pattern	10	3	1/4	1-split	" " Top-carving.	" "
3	1	" Cap	39	1 3/4	7/8	1		" "
4	1	Low-back	33 1/2	5 1/2	5/8	1	Fancy-figur.	" "
5	2	Center-filling-strip	15	7/8	1/4	1-split	- Glue-on-low-back	" "
6	4	End- " "	7 1/2	7/8	1/4	1-	" " " "	" "
7	2	End-post.	5 1/2	1 3/4	1	1 1/4		" "
8	2	Center-pilaster	5 1/2	1 3/4	1/2	1		" "
9	2	Turned- "	5 1/4	1 3/4	1 3/4	2	(1-make-two.)	" "
10	1	Top.	40	19	7/8	1	Fancy-figur	" "
11	1	Front-rail-in-top-frame.	39	2 3/4	7/8	1	- miter	Pl- "
12	2	End " " " "	18 1/2	2 3/4	7/8	1	" - "	" "
13	1	Back " - " "	33 1/2	2	7/8	1		" "
14	4	Partly-turned-legs.	32 1/4	1 3/4	1 3/4	2	Glue-on-blocks.	Qt- "
15	8	Blocks	3	1 3/4	7/8	1	" " legs.	" "
16	8	"	3	3 1/2	7/8	1	" " "	" "
17	8	"	1 3/4	1 3/4	1/2	1	" " "	" "
18	8	"	1 3/4	2 1/4	1/2	1	" " "	" "
19	1	Turned-ornament-on-legs.	8	1 1/2	1 1/2	1 3/4	(1-make-two.)	" "
20	2	End-Rails.	14	5 1/8	7/8	1		" "
21	2	Shelf-end-rails	14	3	7/8	1	" see-pattern.	" "
22	2	End-stretcher.	14	1 1/2	1 1/8	1 1/4		" "
23	1	Back-rail	33 1/2	5 1/8	3/4	1	"	Pl- "
24	1	Shelf-back-rail	33 1/2	2 3/4	3/4	1		Qt- "
25	1	Back-Stretcher	33 1/2	1 1/2	1 1/8	1 1/4		" "
26	1	Front- "	33 1/2	5 1/2	1 1/8	1 1/4	see-Pattern.	" "
27	1	Center "	10	1 1/2	1 1/8	1 1/4		" "
28	1	Shelf	36 1/2	16 1/2	3/4	1		" "
29	1	" base-rail.	33 1/2	4	3/4	1	see-pattern. -Glue-on-carving	" "
30	1	" -carving	15	4	3/8	1	" " " " base-rail	" "
31	1	Drawer-front.	33 1/2	4 1/4	7/8	1	Fancy-figur.	" "
32	1	" back	33 1/2	4 1/4	3/8	1		Pl- "
33	2	" sides	15 1/2	4 1/4	3/8	1		" "
34	1	" bottom	33 1/8	15 1/2	3/16		3-Ply-Veneer.	" "
35	2	Frame-rails-under-drawer.	36	2 3/4	7/8	1		" "
36	2	Cross " " - "	12 1/2	2	7/8	1	"	" "
37	1	Dust-panel- " - "	32 1/2	12 1/2	3/16		3-ply-Veneer	" "
38	15	Feet-of-moulding	1	3/8				Qt- "

Stock Bill for Serving Table.

It is customary to draw the plan with red lead pencil, the front elevation with black lead pencil, and the side view with blue lead pencil.

After the drawing has been completed, prepare a stock cutting bill as shown, giving the item number, the number of pieces, the description, or name of pieces, the exact length, width, and thickness of pieces, the dimensions of rough stock to be used, the

and allow for jointing and ripping. As the actual size of the top frame rail is 39″ by $2\frac{3}{4}$″, the stock should be ripped 40″ by 3″, thus allowing for mitering and jointing. This allowance is universally used thruout the woodworking industry.

Cut all the long pieces first so as to avoid wasting material. All invisible or inside material should be cut out of a cheaper grade of lumber, such as elm,

beech, birch, or maple. If it is desired to veneer any part, chestnut or basswood are the best to use for the core stock because they "draw" less and hold glue well.

Select two-inch stock for the legs. Surface one side and square an adjacent side, plane the two remaining sides to $1\frac{3}{4}''$, select blocks as described in the bill of material for extra thickness, surface one side and glue to legs as shown on drawing (on the plain grained side). After the glue has properly set, plane the edges of the blocks to the exact thickness of the legs and glue on the remaining pieces which will extend to the outer edges of the first two blocks. One of these last blocks should be used as a face side when the turning is completed. Locate the dowel centers to receive the end rails, shelf, base rails, and end stretchers. Care must be exercised to bore the legs in pairs. Bore the back legs to receive the end rails, back rail, shelf, and back rail for the stretcher. Bore the front legs to receive the end rails, frame under drawer, shelf, base rail, and stretcher.

To make the frame under the drawer, get out front, back, and end rails according to the rough dimensions. Joint one edge of each piece, cut a $\frac{1}{4}''$ groove, $\frac{1}{2}''$ deep on the rough edge to receive the dust panel. Cut the end rails to the exact length, allowing $\frac{1}{2}''$ on each end for the tenons. Cut the tenons $\frac{1}{4}''$ by $\frac{1}{2}''$ to fit into the front and back rails. Cut the three-ply dust panel 1-16″ smaller (over all) than the space provided by the grooves. (Three-ply veneer is used because it does not shrink or swell as does the solid wood.) Warm the material and glue together. Care must be taken to clamp the frame square. When the glue has set, cut to exact length and rip to exact width. Notch the corners to fit around the legs as shown. Bore the front rail to receive the dowels.

Get out the material for the top and shelf. Joint and glue. Care should be exercised in matching the grain so that the figures will be uniform when the material has been glued. Let the piece stand at least 24 hours before planing; 48 hours is better. If planed too soon after gluing, the joints are likely to raise and show a slight ridge their entire length. This is due to the moisture which is present in the gluing process. When sufficiently dry, plane to the thickness required, rip to width, and cut to exact length. Shape the molding on three edges to conform to the drawing. Notch the shelf to fit around the legs and rabbet to receive the base end rails and base front rails.

Get out the upper end rails, cut to the exact dimensions, rabbet to receive frame under drawer, and bore two $\frac{3}{8}''$ dowel holes in each end to receive the legs. Joint one edge of the shelf end rails, cut to same length as upper end rails and band saw to pattern. Bore one $\frac{3}{8}''$ dowel hole in each end to receive the legs, and rabbet the top edge as shown to receive the shelf. Work the end stretcher to the finished dimensions and bore one $\frac{3}{8}''$ dowel hole in each end to receive the legs.

The upper back rail, shelf rail, and back stretcher should be gotten out next and all cut to the same length. This, together with the front stretcher and base rail, should correspond with the shoulder length of the drawer frame. Cut the top frame material to the rough size. Joint one edge and face mark. Miter one end of the front and end pieces, lay off the lengths; miter the other end of front rail, placing the face mark against the fence or miter box. Square the ends of the end rails to the exact lengths, and bore two dowel holes to receive the back rail. Cut the top frame back rail to length and bore two $\frac{3}{8}''$ dowel holes to receive the end rails, glue, and when properly "set," shape a moulding on the front and end edges. Bore screw holes at intervals of one foot and countersink on the under side. This is done as a means for fastening the top.

Get out the stock for the low-back, cut it to proper length and width, and dress to thickness required. Face-mark, joint both edges, bore three $\frac{3}{8}''$ dowels to receive end posts. Bore corresponding holes in the end posts to receive the low-back. Glue center posts and filling strips to the low-back as shown. This forms a panel around which the moulding is mitered. Bore five $\frac{3}{8}''$ dowel holes half way thru the cap, and one inch into the low-back and glue together. Glue the carving to the low-back with two $\frac{1}{4}''$ dowels bored one inch into the carving and one inch into the low-back.

All large pieces such as the top and shelf should be glued first so as not to delay the final assembling. When the glue has set, glue the front base rail and back rail to the shelf. Both ends, including the posts, upper end rails, shelf end rails, and end stretchers should be glued in pairs. It is well for the beginner not to attempt to assemble the whole project at the same time. After the glue has set sufficiently, the assembling may be completed. Place all remaining loose pieces in a warming box for about ten minutes. Apply glue to all dowel holes in the ends and grooves. Clamp together and square the whole. Glue and screw the top frame to the rails and legs. (At least six clamps should be used in this operation.) Assemble the drawer, fit, and glue the drawer guides into place. Bore for pulls and lock. Glue drawer stops either on the front rails or on the end rails at the back of the drawer. Fasten the top with screws thru the under side of top frame.

The turned ornaments are made by gluing two pieces with a piece of old newspaper sandwiched between. When the turning is completed the paper joint may be easily split(any other paper will not do). It is also customary to use glue size for the same purpose. Glue the ornaments as shown.

The average high-school student does not spend enough time in the shop to become a carver, therefore, a suitable substitute may be offered in the form

of a composition which is almost an exact imitation of the wood carving. It takes the same finish as the wood and is easily applied by any student. This may be purchased in any style or design.

All parts should be scraped and sanded before gluing. Face marks should be used whenever it is necessary. They determine the edge or part to work from and enable the craftsman to work quickly and accurately.

The whole project should be given a final sanding and cleaning before applying the finish.

PRACTICAL MILLINERY

Madge Lamoreaux, Household Science Department, University of Illinois

(Second Article)

VI. Directions for Making and Covering a Wire Frame:

Materials needed:

One roll of black or white silk brace wire.
Tie wire.
Pliers.
Pins.
Tape.
Maline or georgette crepe.
Colored pencil.
No. 5 Milliner's needles.
Milliner's thread.

Brim. 1. The pieces of tie-wire should be prepared by winding the tie-wire five times around three fingers held flat, and cutting this skein at each end, thus making ten pieces, about one and one-half inches long.

2. Take head-size with tape and make two head-size ovals of the same dimensions. (Fig. I.)

3. Cut two pieces of brace wire from 18″ to 24″ long each, depending on the size of the brim desired. Cut four more pieces from 6″ to 12″ long each. Straighten all wires before using them.

4. Mark the exact front and back of each head-size, and divide each half into quarters, thus making eight equal divisions on each wire.

5. Holding one of the head-size ovals in your left hand, twist one of the long wires around the head-size at the back, holding the two wires firmly with your thumb and first finger. Stretch the wire across the oval from back to front, and twist around once. The ends should extend equally beyond the head-size. These form two of the spokes.

6. Put on the other long wire from side to side in the same manner (Fig. XI). Take care that the head-size remains oblong and a good curve. These cross-wires hold the frame in position and should not be removed until the entire brim is finished.

7. Bend wires downward at right angles to the head-size. Measure down $\frac{3}{4}$″ from head-size and bend the wires outward at right angles. Place the second head-size oval in this bend (Fig. XII). Holding the wires firmly in place twist the spoke once around the lower oval at each side. Pinch all joinings until the wires do not slip.

8. At the divisions marked on the side-fronts and the side-backs, twist on the four short spokes, fastening each one first at the upper head-size and then at the lower one. Be sure that you keep the distance between the two ovals exactly $\frac{3}{4}$″, and equal distances between the spokes, otherwise your frame will not be steady.

9. You must now decide on the size and shape of your brim. Measure out the desired distance from the head-size and bend the spokes upward at right angles to indicate the size. The same measurements may be used as for the willow frame. Cut the edge wire the size indicated, allowing three inches for lapping. Press the curve out of it and form a circle, but do not fasten the ends together. Lay the circle over the spokes so that it rests in the right angle bends at the ends.

10. For a sailor shape, lay the frame on a table to be sure that it is perfectly flat. Twist the end of the back spoke over the lap of the edge-wire. Measure the exact size of the edge-wire and mark into eight equal divisions. Twist each spoke around the edge-wire once at the place marked. If any change is necessary, it may be made before the joinings are tightened.

11. To make a mushroom shape, tighten the edge-wire before marking the equal divisions. For a rolling brim, allow from one inch to three inches more than for a sailor shape. After the frame is a satisfactory shape, pinch each joining with the pliers, and fasten each end of the lap of the edge-wire with tie-wires. If you wish your brim very stiff, you may cut a piece of steel wire the exact length of the edge of the brim, fasten ends together with a steel wire fastener, and button-hole on to the brim of the frame.

12. Cut off the ends of each spoke and pinch the end down so that there will be no rough edge. Be sure that all the spokes are on true, straight lines. After the edge of the brim is completed, you may cut the intersecting wires across the upper head-size and press down the ends.

VII. *To Cover Brim with Maline by Steaming.*

1. Measure the distance from the upper head-size to the edge of the hat. Cut the maline in strips with the width twice this distance plus two inches, and the length as long as the edge of the brim. If you have sufficient material, cut it twice as long instead of cutting two strips. There should be from four to eight thicknesses used on the brim.

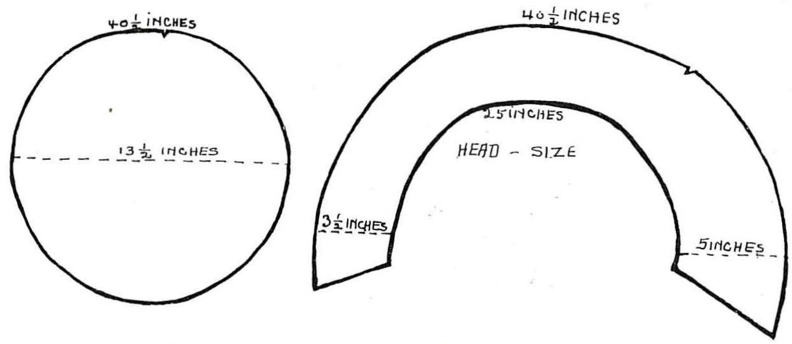


Fig. VIII. Pattern for a Fitted Tam-o-Shanter Crown.

2. Double the maline in half length-wise and fold around the brim, having the edge-wire fall in the fold, and stretching as much as possible. If the strip is continuous, wind around the brim from two to four times, depending on the thickness desired. Join at the back by overlapping the edges.

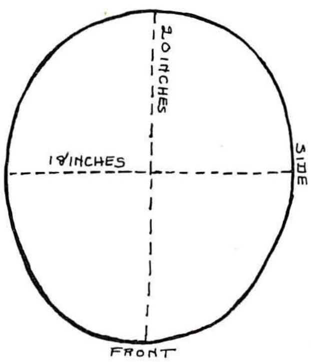


Fig. IX. Pattern for a Shirred Tam-o-Shanter Crown.

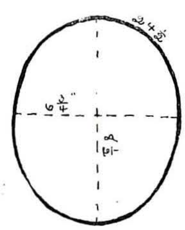


Fig. X. Pattern for Top Crown.

3. Hold the hat in the steam from a tea-kettle until the maline softens. Holding the upper side of the brim toward you, stretch the layers of maline on the under brim toward the center until all wrinkles and gathers disappear. Lap the edge over the top of the head-size from the inside to the outside and pin. Continue around the entire under brim, putting the pins close together.

4. Steam and stretch the layers on the upper brim, and pin to the lower layers just above the lower head-size wire. Continue to steam until every wrinkle has been smoothed out.

5. Using thread the color of the maline, sew with a back-stitch close to both the upper and lower head-size wires.

6. The edge of the brim may be left untrimmed, may be bound with a bias strip of the same material as the crown, or may have a maline drop.

7. When georgette crepe is used on the brim it is cut on a true bias and stretched on in the same manner but without steaming. It is an easy material to work with.

VIII. *To Make a Drop for a Transparent Brim.*

1. When made of maline, the material may be cut lengthwise. If made of georgette crepe, the material must be cut on the true bias.

2. Cut a strip as long as the edge of the brim, and from $2\frac{3}{4}''$ to $3\frac{1}{2}''$ wide. Fold in the middle lengthwise, turn down the two cut edges $\frac{1}{4}''$, and run in a basting thread $\frac{1}{8}''$ from the edge.

3. Cut a piece of lace wire the same length, allowing 2″ to lap in the back.

4. Run the lace wire into the $\frac{1}{8}''$ casing made.

5. Beginning at the back, pin the drop on to the upper edge of the brim so that the lace wire just overlaps the edge-wire. The fullness of the drop must be regulated so that it falls at right angles to the brim in a soft fold. Sew on with the stab stitch close to the wire in the same manner as a facing is sewed on (Fig. IV). Remove basting and join the ends at the back with a small seam. The lace wire may be joined with a steel wire fastener or overlapped and tied.

IX. *Examples of Simple Designs.*

The easiest way to begin to design hats is to study some examples which illustrate the different styles, trimmings and materials. I have taken as examples some of the hats which were made in my millinery class this year by girls who had had no previous experience in millinery.

One of the most becoming models is Fig. XIV. It is the black-and-white combination, supreme in its popularity at present and especially serviceable as it can be worn with a gown of any color. The upper brim and the entire crown are made of black panne velvet. The top crown is soft, and the side crown is put on with a wire cording. (Fig. VII.) The

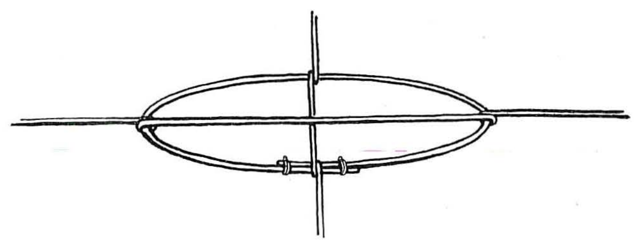


Fig. XI. Upper Head-size showing placing of Long Spokes.

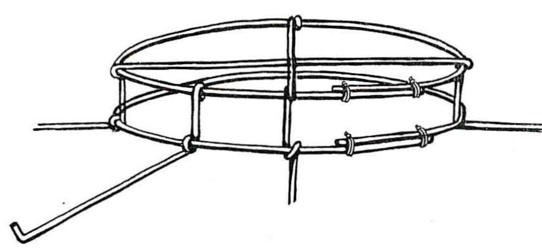


Fig. XII. Head-size showing one Short Spoke added.

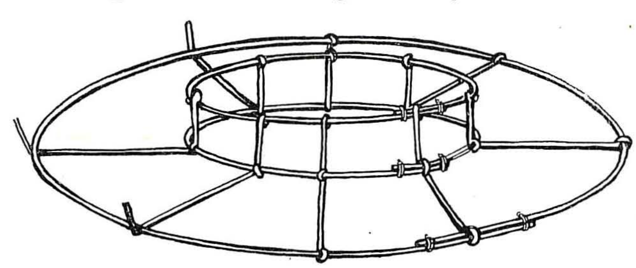


Fig. XIII. Completed Wire Frame.


Fig. XIV.


Fig. XV.


Fig. XVI.


Fig. XVII.

facing is made of two thicknesses of white georgette crepe with a wire cording at the edge. For trimming you will find the popular white grosgrain ribbon made into a stunning bow which measures 17″ across the widest loop. Fig. VI shows how the first loop is wired to serve as a foundation for the other loops. The six white buttons are just $\frac{1}{2}''$ button-molds covered with bits of the ribbon.

While you are thinking of black-and-white combinations, I will tell you about Fig. XV, which is more of a sport hat. It is a slightly mushroom shape with black velvet on the upper brim and crown. The decoration is simple and consists of three rows of $\frac{3}{4}''$ basting stitches made of white Germantown yarn on the brim, and six rows on the crown. Even the balls are made of yarn and they bob around saucily with every movement of the wearer. If you could peep beneath the brim, you would find the facing was made of white braid.

Very often one needs a severe black hat for hard usage. Fig. XVI is made of black satin except the under brim which is of black straw braid. The last row of the braid serves as a binding for the brim. The ornament has been evolved from a few bits of satin made into petals by gathering the satin over a heart-shaped loop of wire. To relieve the sombreness, the edge of each petal is overcast with bright orange chenille, and a group of French knots made of chenille cluster in the center of the flower. A narrow bias band of satin at the base of the crown tends to relieve its height.

One of the prettiest and most becoming hats is Fig. XVII. It is made with two thicknesses of pink georgette crepe on the upper brim and crown and pink braid to match as a facing. You would never guess that the chic little ornament in front is made by covering a dozen small balls of cotton with pieces of the crepe and outlining each one with black chenille. The five stiff leaves are made on a wire foundation and joined to the wire covered stem. If you wish to look stylish, be sure to wear your hat tipped over your eyes.

Fig. XVIII is an inexpensive garden hat made entirely of gingham. The bias flange of blue and white checked gingham is put on as illustrated in Fig. V. The soft top crown, bias band and bow at the base of the crown are also of the checked goods, while the facings on the upper and under brims, and the side crown are of plain blue material. A hat of this kind could be made of material to match any gown.


Fig. XVIII.


Fig. XIX.


Fig. XX.


Fig. XXI.


Fig. XXII.


Fig. XXIII.


Fig, XXIV.


Fig. XXV.

The hat in Fig. XIX was made to match a particular gown. You cannot tell from the illustration how pretty are the colors—rose and dove gray. The upper brim, side crown and the six button-molds are covered with rose-colored voile, while the straw facing, top crown and bows are of gray straw.

A stunning turban, which is suitable to use in an automobile, is shown in Fig. XX. The high crown is covered with a nigre brown taffeta. The brim is made of a bias strip of willow stretched at the upper edge and wired, before covering with a bias strip of velvet of the same color as the taffeta. A casing of the silk was made over a length of wireless cord, and formed into the loops and coils illustrated.

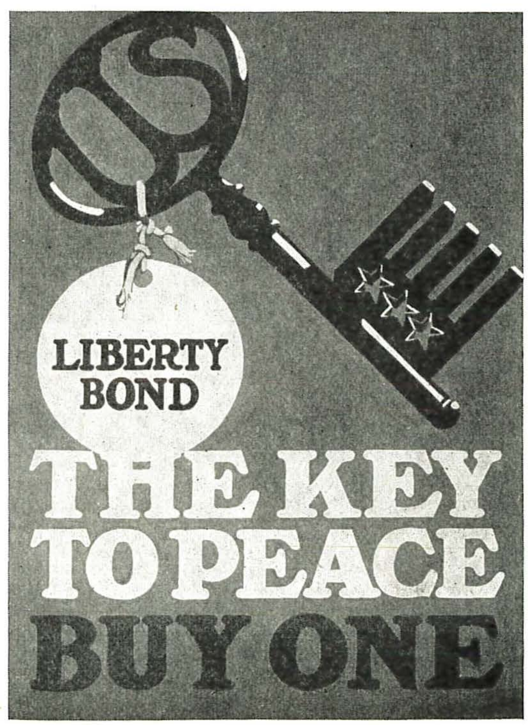
Some of the prettiest hats are made with transparent brims, using wire frame foundations. One of the least expensive and yet the most stunning hats is made entirely of black maline. (Fig. XXI.) The maline was steamed on to the brim and on to the straight side and top crown. The trimming was made of a double fold of maline laid in large box plaits around the crown, and held in place at the base by a narrow band of the maline. The drop softens the edge of the brim and adds to the daintiness of the hat.

Fig. XXII shows another hat with a steamed black maline brim and a soft drop at the edge. The soft crown of black satin is tacked to a 3″ foundation of willow. Two yards of heavy, double-faced satin ribbon form the band and bow. The white facing of the ribbon is very striking where it is allowed to show.

Fig. XXIII is a very youthful model. The black maline is gathered slightly on to the wire brim. The black velvet tam-o-shanter crown is cut as Fig. IX, and lined with crinoline. Fig. VIII could have been used instead. The crown is caught in on the left side with a small bunch of red berries and finished with a long black chenille tassel.

Fig. XXIV and XXV both have stiff, straight brims of white georgette crepe stretched on to a wire foundation. Fig. XXIV has a soft black velvet crown finished at the base with a simple band and knot of narrow white grosgrain ribbon edged with black. The same ribbon binds the edge of the brim. Fig. XXV has a soft shirred crown of white satin on a crinoline foundation. Both foundation and satin are cut from Fig. IX. The balls and cord at the side are made of the white satin.

I have only been able to touch very briefly on some of the most important parts of the subject of millinery. You will find if you try that the making of your own hats is practical, economical and fascinating work and is equally useful both to the teacher and to the home maker.



PRIZE POSTER.
Art Alliance Competition for Second Liberty Loan Campaign.

THE MAKING OF A ROW BOAT MOTOR

F. M. Dannenfelser, Hackley Manual Training School, Muskegon, Mich.

FIGURE 2 is a photographic reproduction of an outboard or row-boat motor, a problem for drafting room, pattern room, foundry and machine shops in manual training, vocational and industrial schools.

During the last two years, we have built several of these motors, and I know of no other machine that will create so much interest and enthusiasm on the part of the students. It is an especially valuable problem because there is not a wide-awake American boy today who is not interested in motors. When this motor is completed, he does not have to install it on a bed in a boat, get stuffing boxes, shafting, coupling, etc., but he can place it on the stern of a row boat and test his own handiwork. The cost of the machine has been but a nominal sum for castings. By means of his time and skilled labor, he has produced a motor worth many times the cost of the raw materials. He has gained much experience and learned many fundamental mechanical principles. Is there a better way of showing him the value of industrial and vocational education and, at the same time, demonstrating to him an important economic principle? But the principle must be driven home to him.

This engine consists of 66 parts, each part being drawn on a separate sheet so the students may concentrate on the study of one part at a time. There are 31 small sheets, 26 medium sized and nine large sheets and assembled drawings.

Fig. 1 shows a medium sized sheet of the propeller shaft.

Fig. 3 illustrates a large sheet showing the crank shaft.

Fig. 4 is a miniature shaded section drawing of the motor, each part lettered so that the student will readily know the name of the piece he is working, and its relation to other parts.

Fig. 5 is a reproduction of a small sheet of the water pump eccentric.

We have tried to teach students the purpose and function of the part they are designing, stress contained therein, and strength of material to be used; to arrange the material in an artistic and practical way and to combine economy of material and proportion to give the desired strength.

We have given a sufficient number of views, dimension allowances and tolerances necessary to economically produce the part.

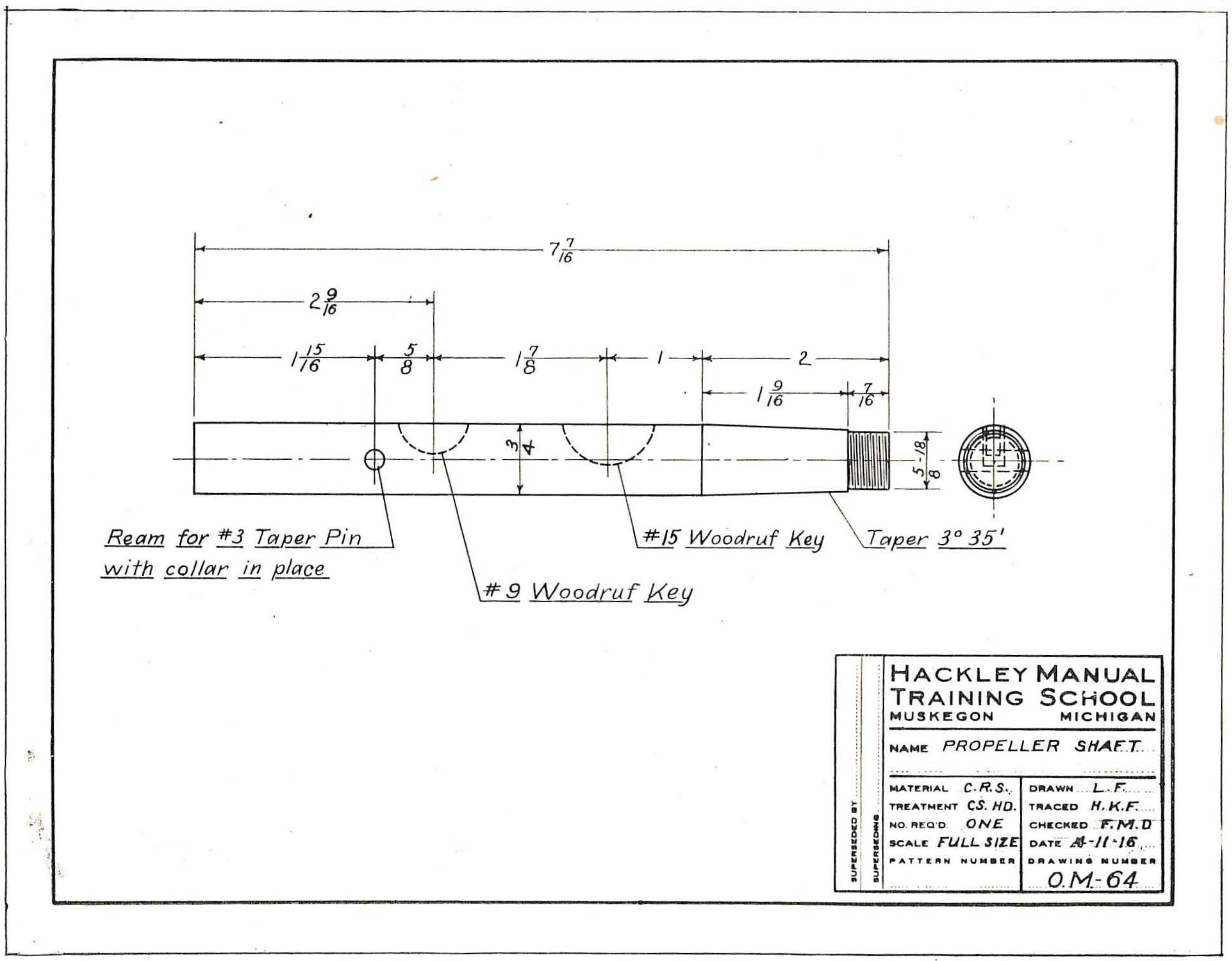


Fig. 1. Medium Size Drawing—Propeller Shaft.

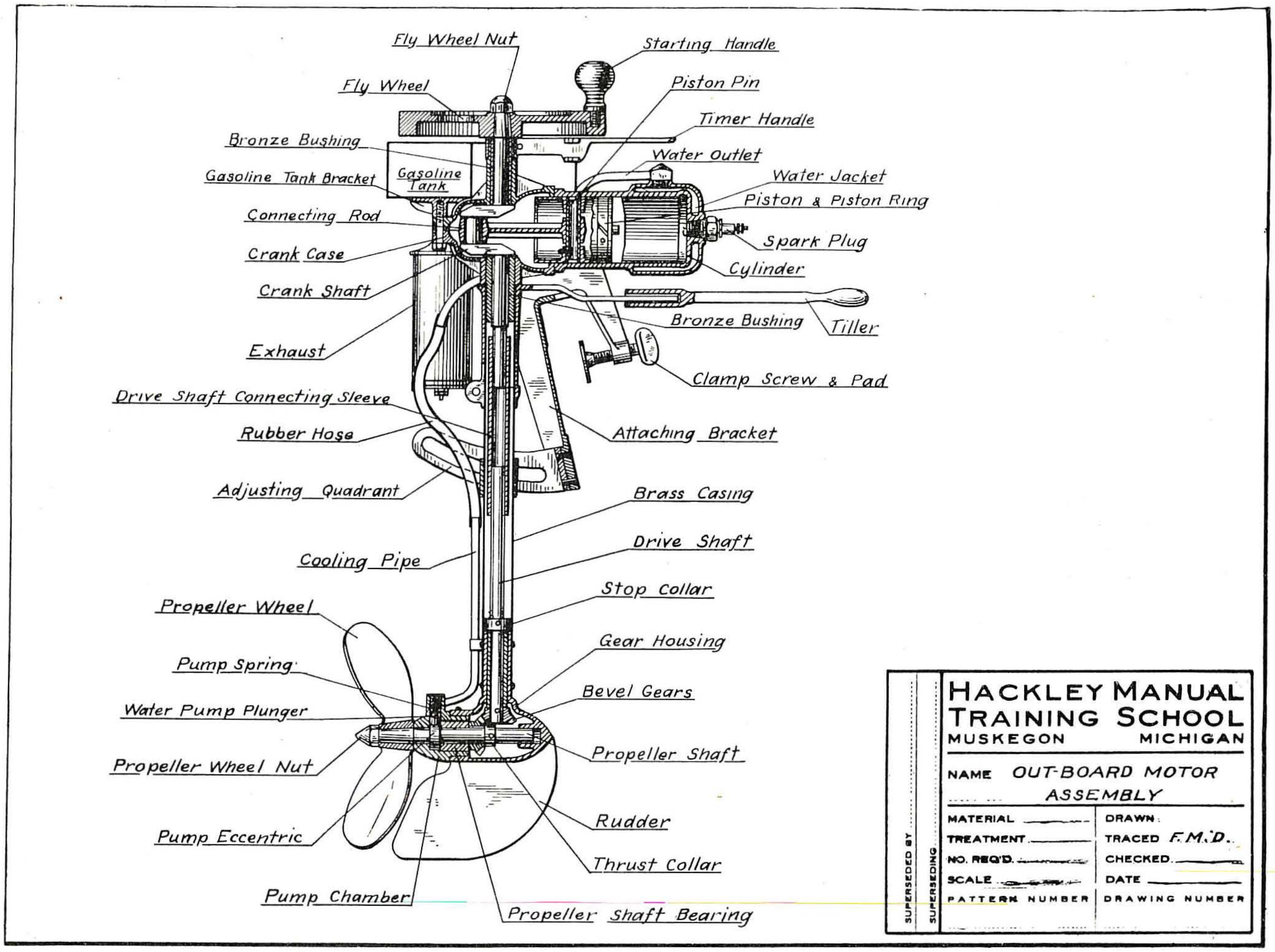


Fig. 4. Shaded Section Drawing of the Motor.

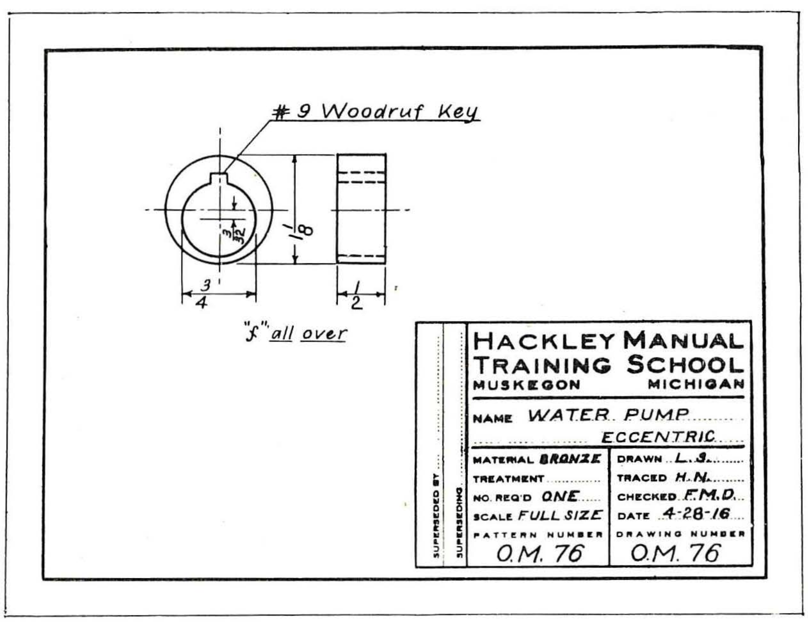


Fig. 5. Small Drawing—Water Pump Eccentric.

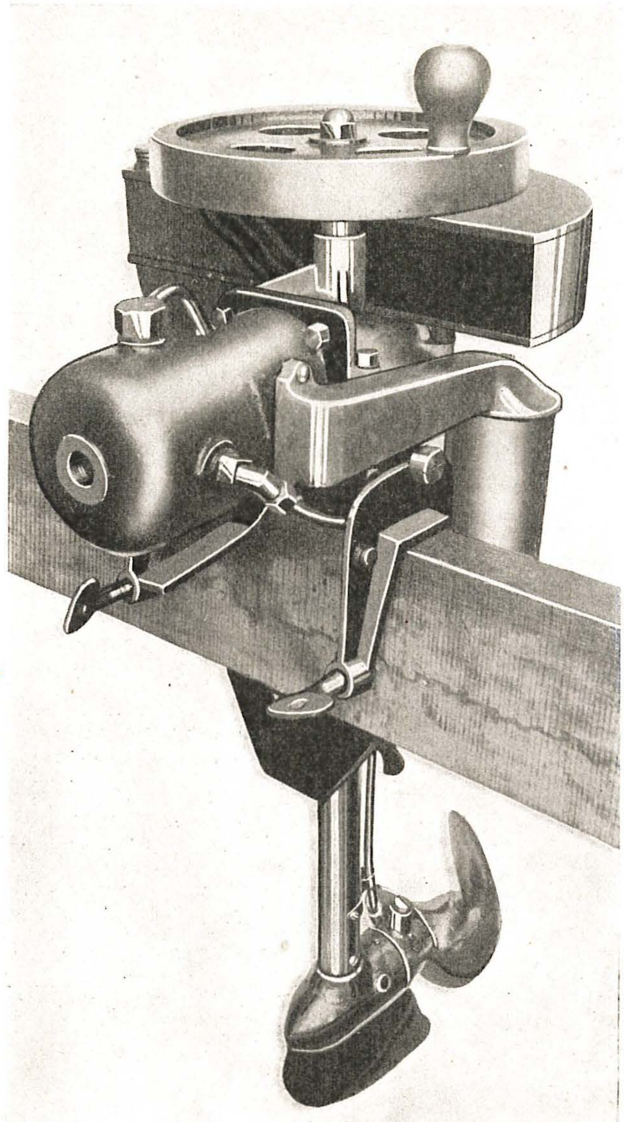


Fig. 2. The Completed Motor.

Mechanical drawing is a science and as a science possesses an art and a technique. The purpose of this work is to teach students the science, art and technique of mechanical drawing.

The engine, illustrated in Fig. 1, was drawn and machined in the Hackley Manual Training School, Muskegon, Mich., under the direction of the writer, head of the drawing and design department, and Mr. P. A. Johnson, in charge of machine shop.

THERE will come a time, as there has been a time, when he who designs a vase, a table or a chair, or a title page, will work in the same spirit as he who designs a picture. Can you not imagine a title page that, to the book, will be as the overture to opera, that will sum up in its decorative aspect, not the individual thoughts of the book—that were impossible—but its spirit; that aroma that lingers in the memory long after the special thoughts of the book are forgotten.—*Theodore C. Steele.*

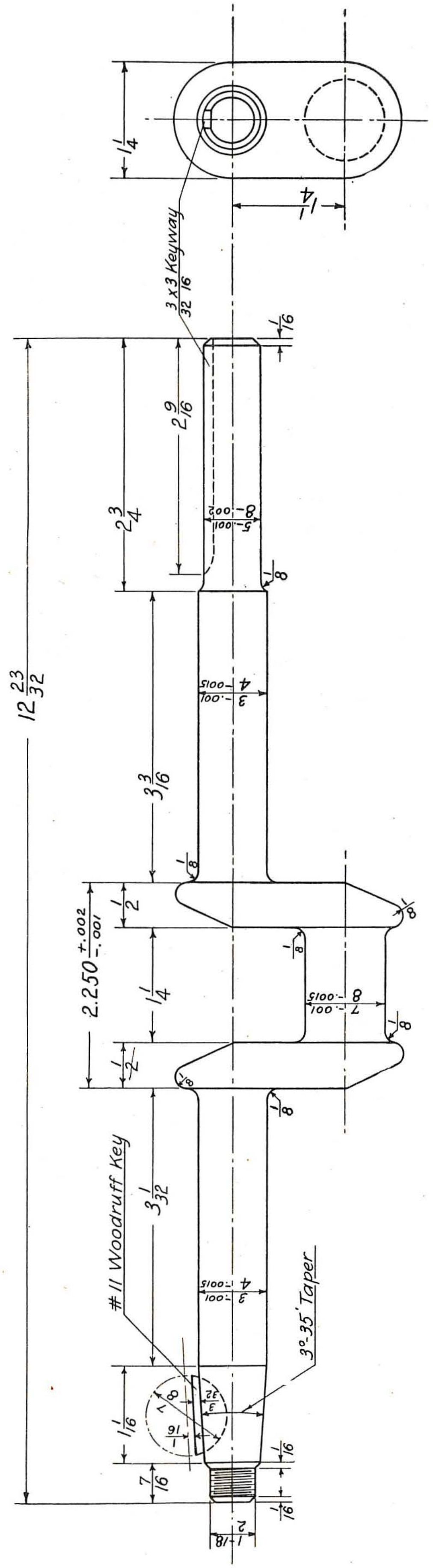


Fig. 3. Detail of a Large Drawing—Crank Shaft.

PRACTICAL PROBLEMS IN PRINTING

Showing Correlation with English and Arithmetic

Frank R. Phillips

THE series of practical problems in printing, of which the first installment is contained in this issue, has been written with a two-fold purpose: to furnish practical display composition problems for the trained teacher who is teaching printing, and to give an idea of correlation to the practical printer who is just beginning to teach the trade.

In preparing copy for the business card, which has been selected as the first problem, care was taken to have same represent the average copy presented to a commercial printer for a job of this nature. No attempt was made to make copy conform to length of line or style of job. In fact, the large amount of matter and the irregular length of line were chosen so as to make the task more difficult of execution.

The problems, including those to be presented as well as the one offered in this article, have been designed with simplicity as the keynote. Any of them can be produced with the ordinary school printing outfit costing $500 or more. Ornamentation will not be included in any problem, unless the use of two or more colors may be construed in that sense.

Copy for problem No. 1, a commercial business card, was presented to the compositor in the following form: "American Publishing Company, Books and Periodicals printed de luxe from foundry type. Books—scientific, educational, technical; Periodicals—The Type Founder, The Educator, The Designer. Represented by Frank Smarky, 76 East 73rd Street, New York."

Upon starting this piece of composition the pupil should be furnished with a composing stick that does *not* automatically lock at ems and half-ems. If compelled to adjust his stick with twelve point quads, the pupil is afforded a practical lesson in accuracy. As the complete job includes three distinct measures, the value of accuracy will be apparent, when he attempts to combine these measures. (Note photograph of type form.)

Specifications for the type form are as follows:

Commercial Business Card.

Size of card, 27x16 ems.

Size of type form, 24x13 ems.

Type used, Century Oldstyle.

Sizes of type used: First line, 8 point; second, third and fourth lines, 6 point; fifth line, 18 and 14 point; sixth line, 12 point; seventh line, 6 point; eighth line, (left) 6 point; eighth line, (right) 10 and 8 point; ninth line, (left) 8 point; ninth line, (right) 10 point.

Time limit: 1 hour, 30 minutes.

MEMBERS OF PHILADELPHIA STOCK EXCHANGE — LONG DISTANCE TELEPHONE MANCHESTER 8223

J. S. HISON & COMPANY

BANKERS

STEAMSHIP EQUIPMENT BONDS

412 CHASE STREET — PHILADELPHIA

City Telephone 1234 — Bell Telephone 5678

MONSEN & BURNS

Designers, Manufacturers and Wholesale Dealers

ARTISTIC GOLD JEWELRY

Monsen and Blake Streets

NEW HAVEN

Telephone 769 Central

DR. GEORGE HUSTEN

CHIROPODIST

Office Hours
10:30 A. M. to 3 P. M.
5 to 7 P. M. — 425 Nuborne Street
COLUMBUS, OHIO

THE NATIONAL EXTRACT COMPANY

Operating

The Baltimore Product Co. — The Illinois Vinegar Co.

FRANKLIN H. DENNIS

Assistant Manager

THE BALTIMORE PRODUCT COMPANY

215 Ridgely Street — Baltimore, Maryland

THE ABOVE ILLUSTRATIONS REPRESENT DIFFERENT STYLES OF COMPOSITION FOR THE SETTING OF COMMERCIAL AND PROFESSIONAL BUSINESS CARDS.

BOOKS
SCIENTIFIC
EDUCATIONAL
TECHNICAL

PERIODICALS
THE TYPE FOUNDER
THE EDUCATOR
THE DESIGNER

AMERICAN PUBLISHING COMPANY

BOOKS AND PERIODICALS
PRINTED DE LUXE FROM FOUNDRY TYPES

REPRESENTED BY
FRANK SMARKY

76 EAST SEVENTY-THIRD STREET
NEW YORK

MODEL OF COMPLETED JOB.

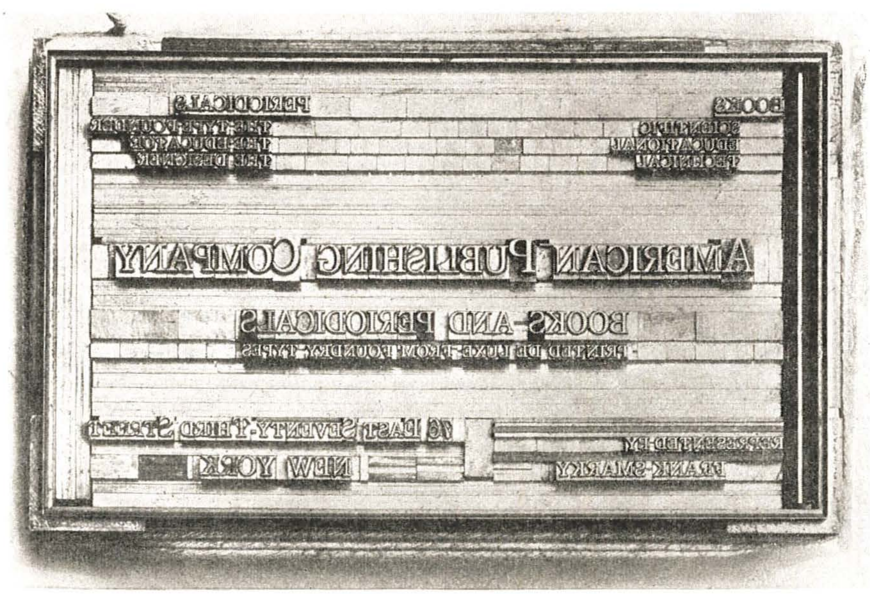
English Correlation.

Composition.

Business cards may be divided into two classes, professional and commercial.

The professional card usually is smaller than the commercial card, and is composed in types which signify conservatism and dignity. Dignity in composition may frequently be attained by using capital letters entirely. The professional business card, to be effective, should not be overcrowded with type matter. The most prominent line should be the name of the person or company. This line should be set a trifle above center of the card. The rest of the copy for a professional card should contain the nature of the profession engaged in, address, office hours, and telephone.

The commercial card affords greater opportunity for display composition, yet to be impressive, it should be restrained in character. As a rule, bizarre effects are not profitable, as they detract from the effectiveness of the card, and decrease its advertising value. The size of the commercial card is not of so much of importance as is the size of the professional card, yet it is not advisable to have too large a card. Dogmatic rules governing the sizes of business cards do not exist. However, owing to the high price of cardboard at the present time, the cost should prove an economic reason for issuing a comparatively small card. Copy for a commercial business card should include information about the particular product or products of the company, and about the company itself, that it is desired to furnish to the public. The type used should be legible and of pleasing design. Emphasis may be obtained by using larger sizes of the same type series, or, by using a heavier type, either of the same or another series. In using types of different series care should be taken to see that the faces harmonize.



THE TYPE FORM OF THE MODEL JOB.

Mathematical Correlation.

Commercial Business Card.

1. Stock to be cut from four-ply Bristol cardboard, measuring 22x28 inches per sheet. Size of to be 27x16 ems. How many sheets of cardboard will it require to furnish five thousand cards?

2. How many ems (pica) are contained in the type area of a form 24x13 ems?

3. If set in eight point type (solid) how many lines would it take to fill a space 16 ems wide?

4. The American Publishing Company has quotations on 5,000 cards, size $4\frac{1}{2}$x$2\frac{3}{4}$ inches, at $2.00 per thousand. Should they desire a larger number the price is 98 cents per thousand for each additional thousand. What would fifteen thousand cards cost?

5. The compositor who set the card was paid $3.60 per day of eight hours. It took him one and one-half hours to set the job and lock it up. What was the cost of composition on this job?

ROOF FRAMING

H. T. Wilhite, Director of Manual Arts,
Logansport, Ind.

To many carpenters roof framing is a stumbling block and comparatively few ever attempt to learn it. Much has been written about this subject, and a great deal more will be written. It is not the purpose of this paper to give entirely new ways of framing, but to show different methods of obtaining the same result. Finally, the use of rods, which have been employed by the writer for several years, will be explained.

A few terms must be fixed in mind before attempting to learn to frame:

Span is the width of the building, or from the plumb cut of the heel to the opposite plumb cut in a pair of common rafters.

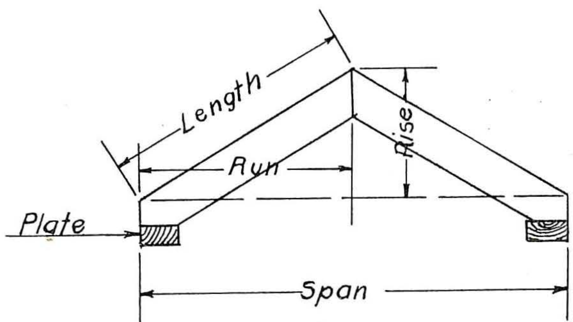


Fig. 1.

Pitch is the slope of the rafter, or the proportion that the rise bears to the whole span.

Rise is the perpendicular distance from the bottom of the heel cut to the top of the plumb cut.

Run is the distance from the outer edge of the plate to a point obtained by a plumb line from the plumb cut.

Fig. 1 illustrates the terms used above.

Length Per Foot Run is the length of a rafter over the run or seat, as it is often called, for one foot. The run is the same for any pitch, but the length per foot run is different. See Fig. 2.

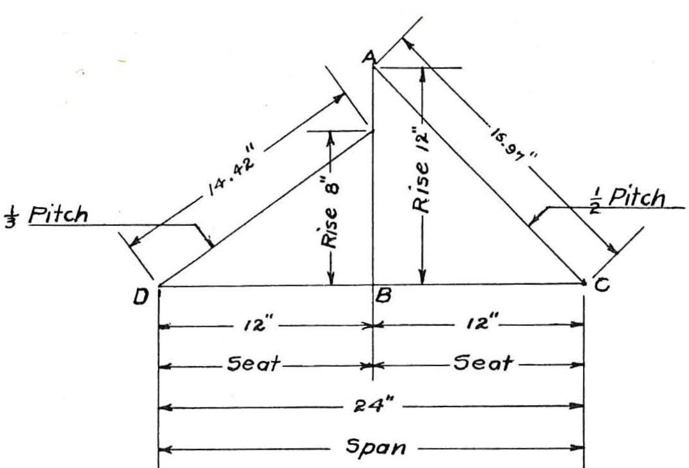


Fig. 2.

Rafters are known by different names: Common, hip, valley, jack and cripple. In order that they fit, they must be the right length and properly

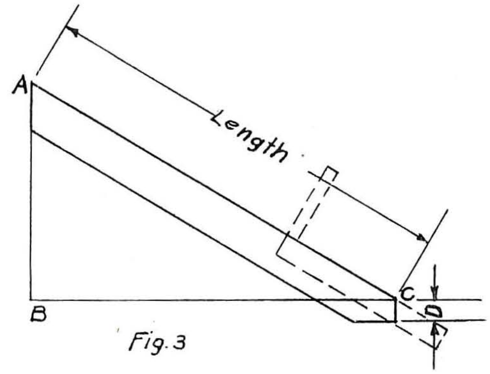


Fig. 3

cut. There are many different rules for obtaining the correct cuts and lengths.

The plumb and heel cuts of all rafters are perpendicular to each other. The common rafter has only the plumb and heel cuts. The hip, valley and jack have another cut called the side, or cheek, cut.

The cuts are found by the graphic method or by the steel square. The latter is much used in practice, but if one understands the graphic method the shorter ways are more readily comprehended. The length should be taken on the top side, and should be measured from the plumb cut of the heel to the plumb cut of the top, as shown in Fig. 3.

When using the graphic method, the drawings should always be made to scale. Set a bevel to the angle BAC for the plumb cut, and BCA for the heel cut. There should be a perpendicular distance above the plate as shown at D, Fig. 3. This may vary to suit, but it is usually done by drawing a line along the blade of a square, Fig. 3. This distance (D) is added to the height of the wall. If the height (D) is not framed at the foot of the rafter, it would be as shown in Fig. 4. It is better to frame the top cuts first.

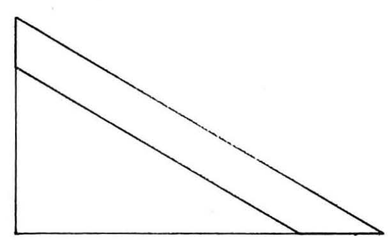


Fig. 4.

The run, rise and length forms a right angled triangle, and by adding the sum of the squares of the rise and the run and extracting the square root the length is found. Expressed in mathematical terms: Let L=length of rafter. R=run and A=rise or altitude.

The length of any rafter of any pitch may be found by using the following formula.

$$L = \sqrt{R^2\ A^2}$$

The length may be found with the steel square by taking the rise on the tongue, and the run (12″) on the blade, and stepping off the top of the rafter the number of times there are feet in the run. In order to do this the pitch must be known. To find the pitch, divide the rise by the span.

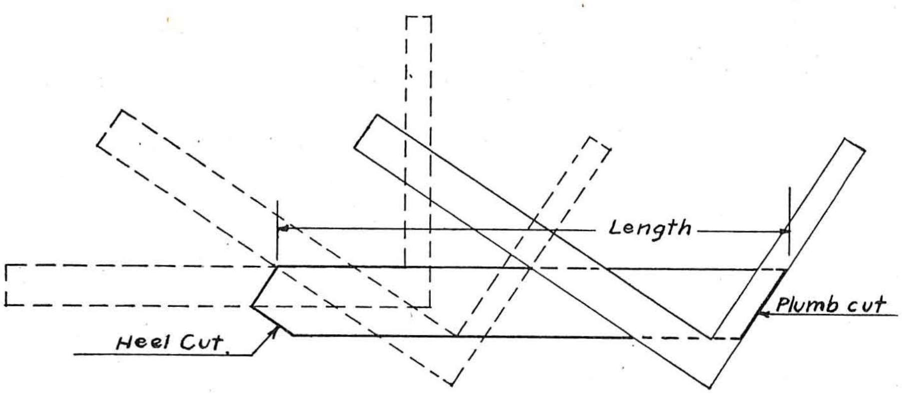


Fig 5.

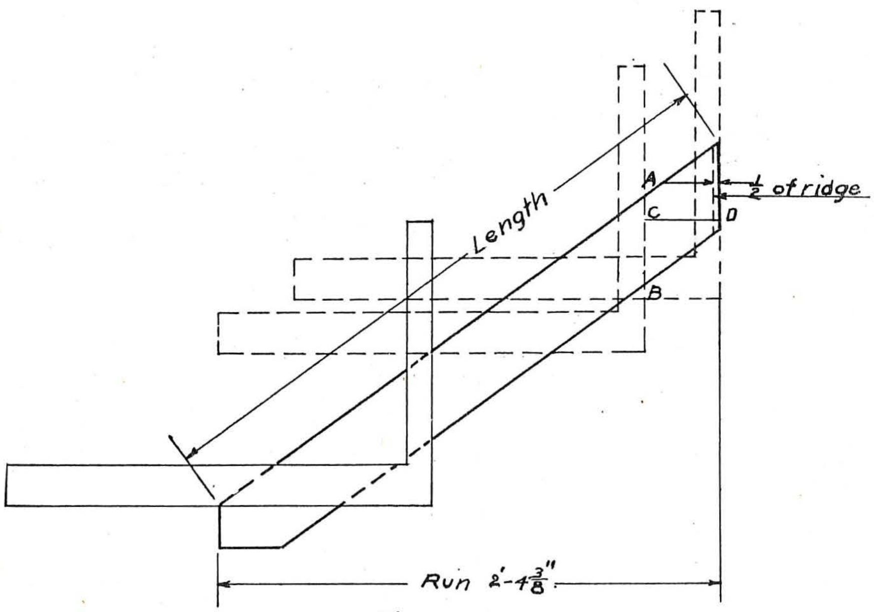


Fig. 6.

To illustrate: A building is 18′ 0″ wide. The rafters rise 6′ 0″.

6 divided by $18 = \frac{1}{3}$. Therefore the roof is $\frac{1}{3}$ pitch.

Expressed mathematically: Let 3 = span; A = rise; P = pitch.

Formula: $\frac{A}{S} = P$.

Fig. 5 shows the length, plumb and heel cuts of a rafter that has a run of 2 feet. Suppose the rafter has not a run of even feet as shown in Fig. 6. In this figure the rafter is drawn in its correct position. If twice the run is stepped off as in Fig. 5 the plumb cut would be at A–B, but as the run is $4\frac{3}{8}$″ longer, the rafter must be longer. Draw CD perpendicular to AB. On this line measure $4\frac{3}{8}$″. Draw the plumb cut DE. If there is a ridge board, measure back one-half the thickness of the ridge board on CD and cut as indicated by the dotted line.

All jacks and cripples are parallel to the common rafter. The following rule then applies:

The Run of Common, Jack and Cripple Rafters is 12″.

Referring to Fig. 2, we find that the line BC (12″) represents one foot of run and BA (12″) represents the rise of $\frac{1}{2}$ pitch—12″ being one-half the span. BD is the run and BE (8″) is the rise for $\frac{1}{3}$ pitch. The length AC is 16.97″. (In practice 17″ is substituted for 16.97″.)

Rule: The Plumb and Heel Cuts of Common and Jack Rafters of any Pitch may be found by taking the Rise per foot on the Tongue and the Run (12″) on the Blade.

Fig. 7 illustrates the use of a collar beam to prevent long rafters from sagging. Ofttimes in a story-and-a-half house collar beams are used as ceiling joist.

As stated before, hips, valleys, jacks and cripples have a cheek cut which is evident by referring to Fig. 8. This illustration is a plan view of a roof which shows:

Hips fitting the corner of the deck and the side of a ridge.

A Valley in the corner of the deck, and against the side of the deck to a ridge.

A Common rafter to the side of the deck.

A Jack to a hip.

A Cripple from deck to valley and a cripple from hip to valley.

A roof may be framed any pitch, but the common pitches are $\frac{1}{4}$, $\frac{1}{3}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, and full. When any of these pitches are used, the length of a common rafter may be quickly found by using the following table:

To find the length of common rafters, multiply the total span by the following:

$\frac{1}{4}$ pitch x .559. Deduct one-half thickness of ridge.

$\frac{1}{3}$ pitch x .6.

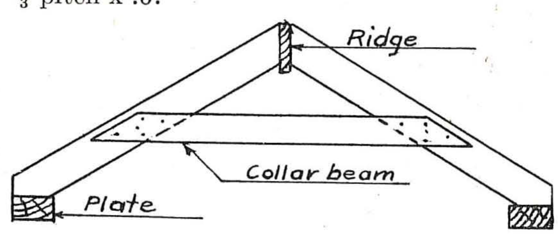


Fig. 7.

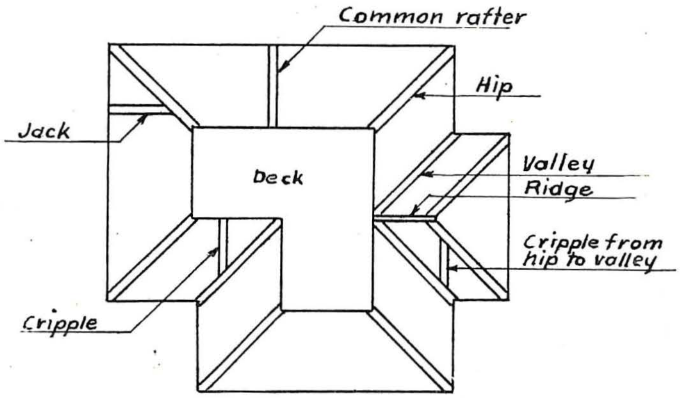


Fig. A

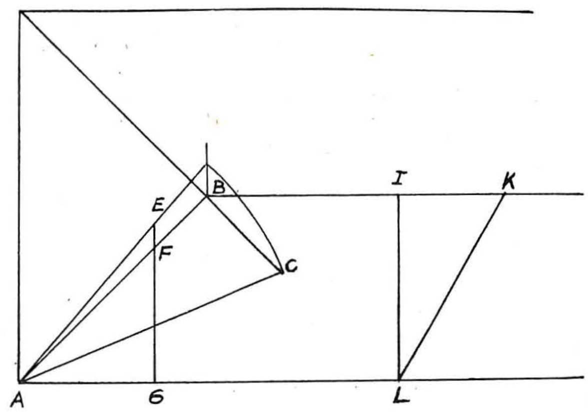


Fig. 9.

AB=Seat of hip.
BC=Rise.
AC=Length of hip
ACB=Plumb cut of hip.
BAC=Heel cut of hip.
FG=Seat of jack.
EG=Length of jack.
AEG=Side cut of jack.
IL=Seat of common rafter
IK=Rise of common rafter.
IKL=Plumb cut of common rafter.
ILK=Heel cut of common rafter.

$\frac{3}{8}$ pitch x .625. Add for projection.
$\frac{1}{2}$ pitch x .7075.
$\frac{5}{8}$ pitch x .8.
Full pitch x 1.424.

Fig. 9 represents a graphic method of finding the length, plumb and heel cuts of hip. Plumb, heel cuts and length of common rafter. Length and cheek cut of jack. The cheek cut of the hip is shown in Fig. 10.

Graphic drawings should always be made to scale.

Deduction must be made for one-half thickness of the ridge on a common rafter, for one-half the diagonal of the hip on the jack and one-half the diagonal of the ridge on the hip.

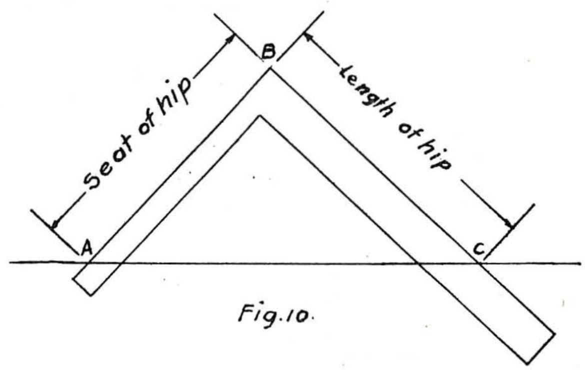


Fig. 10.

Fig. 11 is a plan view of hip, jack and ridge. The dotted lines shown where the top of the hip and jack would extend if there were no ridge or hip. Deduction must be made from the length of the hip equal to the diagonal of a square which is equal to one-half the thickness of the ridge. This measurement must be taken on a line perpendicular to the plumb cut. It is not necessary to make a drawing like Fig. 11. Fig. 12 shows the application of the steel square. Always measure in the center of the hip when laying off length. Deduction is made from the length of the jack in the same manner as the hip.

The distance equal to the diagonal must be made on a line perpendicular to the plumb cut on both hip and jack.

(To be concluded.)

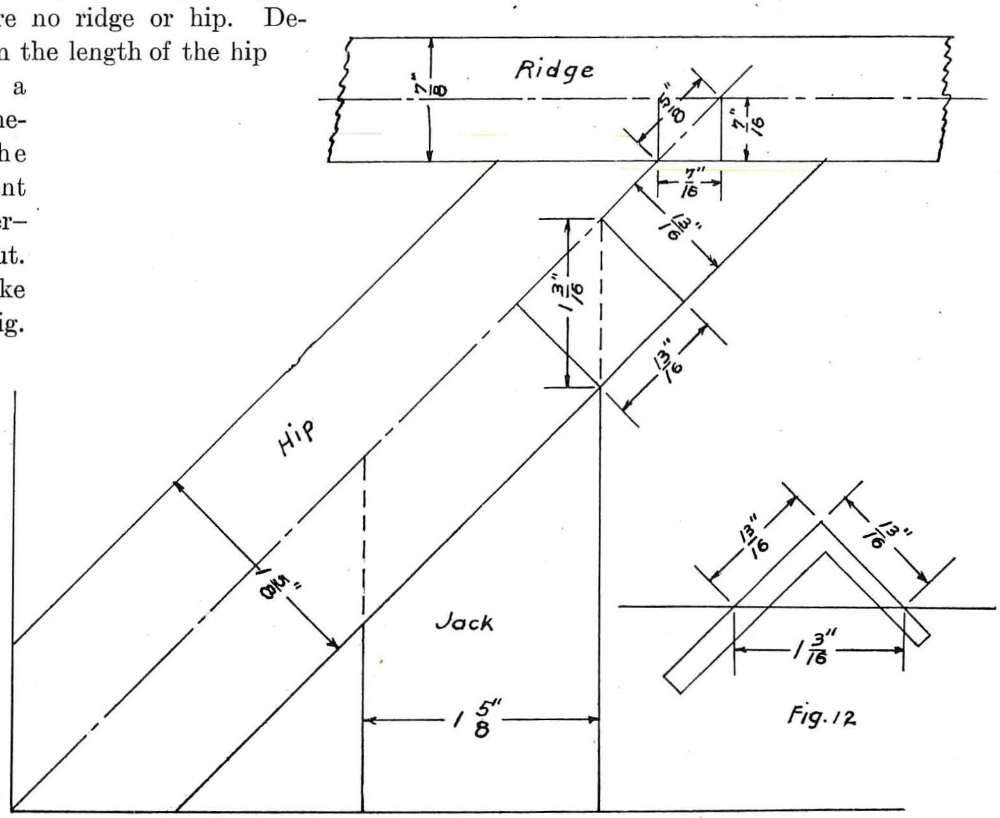


Fig 11.

Fig. 12.

INDUSTRIAL-ARTS MAGAZINE

EDITORIAL

A FIT GIFT FROM AMERICA.

IN 1909 a committee of Americans co-operating with the Sulgrave Institution of Great Britain, started a movement for a great celebration of the Century of Peace between this country and Great Britain. Until very recently, nothing has been done in this direction since the world war began.

The two committees have agreed, however, that now would be an appropriate time to do something to promote the cordial relations and the mutual understanding and good will between Great Britain and America. Among other highly commendable things, it is proposed to erect a replica of a Lincoln statue in London across from Westminster Abbey and the Parliament buildings.

Even a replica of Lincoln in that place, if a replica is the best we can do, touches our pride and meets with our heartiest approval. But we confess to an uneasiness and a chagrin, when we learn that the proposed memorial is to be a replica of Barnard's "Lincoln" in the city of Cincinnati. To those of us who live in the region of Lincoln's home, among people who knew him, and under the very shadow of the great Saint-Gaudens statue, such a proposal comes both as a surprise and a shock.

Those who knew Lincoln are agreed that he dressed in accordance with the conventions of his time; that while his figure was not elegant, his carriage was dignified and of a peculiar and unaffected grace; and that his was a face of refinement, intelligence, kindliness, and power. All these attributes are the very opposites of those portrayed in Barnard's "Lincoln."

It would seem a great pity that with more than one great statue of Lincoln in this country, we should send to London this Cincinnati embodiment of shambling indolence and weak stupidity.

THE TEST OF DEMOCRACY.

AS I left the house a young man halted me at the door. "Have you any work about the house or yard I can do?" he asked. "I charge twenty-five cents an hour and am working my way thru school. My father supplies books and tuition, and I can put in four hours each day. I have just finished some work for your next door neighbor."

He was a husky, likely-looking chap, and of course there is always something to be done about the house or yard for the fellow who is willing to do it.

A little farther on I passed a building used as a barracks for a corps of aviators. Now aviators are the aristocracy of the military. Many of them come from the wealthy families of our extravagant country. This must have been cleaning day at the barracks, for a score of handsome boys in Kahki were raking the yard, sweeping the walks, and putting the bedding out for an airing, under the curt orders of a trim officer who gave no condescending smile or thanks in return.

A little farther on a Red Cross sign on a store window attracted attention. As I passed the clear window and looked within, the room appeared as a factory with rows of busy women at work, sewing and knitting on supplies for our soldier boys in France. I recognized several of the well-to-do and *socially established* dames of the community side by side with those of less established social standing.

It is true that last winter I saw these same dames at a bridge party seriously inspecting their cards while someone else did their sewing and knitting.

Finally I came to the school the young man who asked me for work was striving to attend. I approached the oldest building on the campus and one built shortly after that great strife was ended which established unity and democracy in our nation. Over the door cut deep in the stone were words prompted by the democratic spirit of those times. I have heard these words derided of late years as unsuitable to the aspirations of a great educational institution. To me this morning they seemed not only appropriate but essential. These simple but significant words are "Learning and Labor."

PHYSIOLOGICAL FACTORS TO BE RECKONED WITH.

THERE are certain well known physiological facts that have a greater bearing on the adaptability of certain types of work to growing boys than our discussions and courses of study have recognized. Most teachers have experienced the surprise and disappointment that arise from the fact that boys who have had some woodwork in fifth and sixth grades frequently do but little if any better quality of work in the upper grades than the boys who have not previously done such work. The same thing may often be said in comparing the work of boys in the first year of high school.

This is not strange when one considers the physiological changes that are going on at this period of a boy's life. It is a marked characteristic of this adolescent and pre-adolescent period that a very rapid growth takes places in the length of the limbs—a growth out of all proportion to that of other parts of the body.

A boy passing thru this stage, begins the use of woodworking tools. In the use of the tools, his arms operate as sets of levers. After practicing for some

months in the use of these sets of levers to perform definite tasks, the boy suddenly faces the situation that his arms, or his levers, have lengthened from one to three inches in a year, perhaps a large part of the increase coming during summer vacation.

Whereas such a boy has been accustomed to the use of levers of a certain length, he now finds it necessary to adjust himself to a new set of levers of different lengths and different proportions. No sooner does he get himself adjusted to the new situation of lengthened limbs then the trunk begins its more rapid growth, thus throwing out of adjustment again the levers with which he is striving to do his work.

It is at this awkward stage that the catastrophes happen if perchance the boy undertakes, by invitation, to assist in clearing away the dinner dishes. It is at this unco-ordinated period that the boy stubs his toe, spills the milk, breaks the eggs, throws the ball thru the neighbor's window, and goes thru other interesting and illuminating but highly expensive experiences. It is at this time that courses must be more judiciously planned to take into account of these changes and necessary readjustments.

There is no more profitable study for those who propose to teach boys in the shops than the study of the characteristics and requirements of this period of rapid but unequal growth, and of the birth of new and powerful impulses.

APPLIED ART.

ART applies to most of our activities but the method of application must be adapted to conditions. We are in receipt of a letter from a teacher of art which illustrates this point. This teacher writes: "I have had instruction in the best art schools but find it impossible to interest the boys of our high school in drawing and design. You will find enclosed the outline of work we follow."

The outline was of the usual kind, diversified to touch upon various kinds of graphical and decorative art within the short school term.

There is but one solution to this common difficulty and it lies between the orthodox routine of art instruction and each high school boy's controlling interest.

We have an abiding faith that art applies to the controlling interests of a majority of high school boys as well as girls. The successful teacher of art must make this application.

COMPETITION AFTER THE CONFLICT.

THE reports of all the larger colleges and technical schools indicate that the war situation is having a marked influence on the attendance at educational institutions. From the large shrinkage in attendance, it would appear that not only have college students entered war service but that many young people who formerly attended college are now engaged in industry, commerce, and agriculture.

Nearly all of our more important industries are working every possible minute of the time. The demand for labor has increased to such an extent that many young people have been tempted by the large financial inducements offered to give up their schooling. This situation will make itself apparent, no doubt, in the attendance at vocational schools this year.

There are some elements in the situation which should be brought to the attention of all young men and women. When the war is over and our soldiers return to their former occupations, they will no doubt have preference over all other persons in the matter of employment, and this is perhaps entirely as it should be. The young man, therefore, who has remained at work and has not served his country as a soldier, will meet competition such as he has never experienced before. The indications are that the men who are crippled in war service will have first preference in the matter of securing employment. To meet this competition, those who are remaining at home during the war should prepare themselves for additional responsibility and for positions above that which they now hold. There may or may not be a slump in business, but it seems inevitable that for a few months at least, many persons will be out of employment.

Vocational schools will do well to make this a point in all of their publicity and should urge all young men and women to prepare themselves more fully to meet the competition which will come with the return of our soldiers. Additional training and added skill are the only means which will prepare them to meet this situation.

"COME then, ye by whom the common things of life are clothed with beauty. Come in one harmonious throng. Come, engravers and lithographers, molders of metal, clay and plaster, founders of type, printers upon cloth and upon paper, painters, jewelers, goldsmiths, potters, iron workers, stone-cutters, woodworkers, embroiderers, tapestry makers, book-binders, artists, artisans, comforters; who give us the joy of beautiful forms and of lovely colors. Benefactors of men, come with the painters, the sculptors, and the architects. With them, hand in hand, lead us on our way to the city of the future.

"It holds out to us the hope of more justice and of more joy. You will work in her and for her. From a society more equal and more happy, there will spring a more lovely and a more agreeable art. Artists, artisans! unite, associate with each other; study and meditate together; mingle your ideas and your experiences; with thousands of working thoughts and thousands of thinking hands, take your tasks onward in peace and in harmony."—*Anatole France.*

THE Vocational Education Association of the Middle West will hold its fourth annual convention in Chicago, January 24, 25 and 26, 1917. The meetings are to be held in the New Morrison Hotel. President S. J. Vaughn, DeKalb, Ill., is preparing the program.

Making Stage Scenery for School Purposes

O. R. Webb, Battle Creek, Mich.

The seniors of the high school of Battle Creek, Michigan, were to give a play. Because of the shortness of time and the cost of the ready made materials, it was decided that the scenery should be made, if possible, by the people of the school. Only a little over a week must be consumed in having everything in readiness. The drops, curtains, and scenery must be designed, made and painted in this short time.

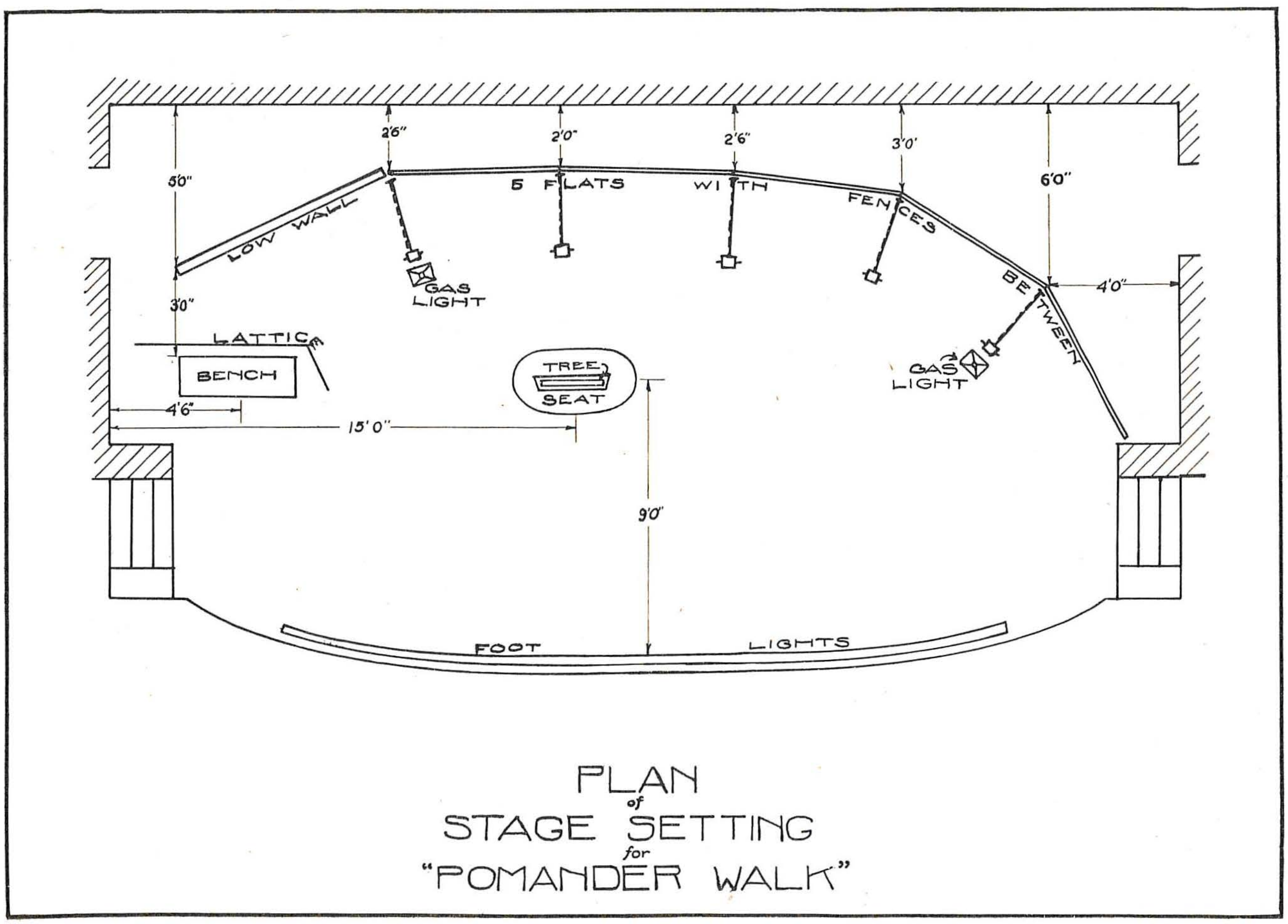
This innovation in the high-school theatricals was done on time and the scenery produced did not have to have any apologies made for it, as the illustration will show. The students of the Manual Training Department, with little assistance, were able to accomplish this. The way it was done is described below. With the aid of the drawings it will be seen that the scenery was not loosely constructed.

The play, "Pomander Walk," needed a row of houses or flats, a tree, seat, low wall, lattice work, rails and light posts, as shown in the illustrations. The windows of two of the flats had to be opened and as also every one of the doors.

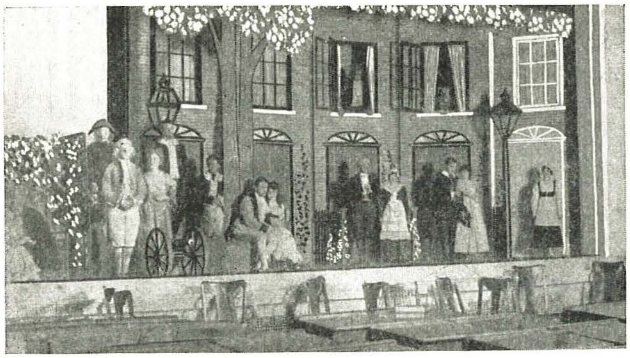
The stage of the high school was measured and a sketch was made, to scale, by the mechanical drawing department, of the placing of the "props." The sketch is shown in one of the drawings with the placing of the pieces on the stage, which being small required a great deal of figuring so that everything would not be crowded. The sketches and drawings of the row of flats were next made in the same manner and then turned over to the art department. The coloring of the flats was put on the drawing by that department and returned to the woodworking department. In the meantime the drawings for the lighter pieces of property were made by the mechanical drawing department and turned over to the woodworkers. These drawings are shown here as they were used.

Seven-eighths-inch wood was used and ripped into strips four inches wide on the circular saw. From these strips the various lengths were cut as shown on the drawings. As the joints were all butt-end this was done quickly. No edge planing was done other than taking off the roughness. The flat faces had been previously run thru the planer. The sides, upper, lower and middle cross pieces were then put together butt-end and were held there firmly by various angle irons on the back and corrugated nails at the joints. The fronts had corrugated nails, five-eighths inch, driven in across the joint. Each angle iron was drilled and countersunk for screws. The pieces for the door casings and window casings were next put in between the cross pieces. They were held in place with strap irons in the same way as the angled irons. These helped the bracing of the whole of each panel or flat to a great extent. The door was made up of pieces as shown on the drawing, sides and cross pieces put together in the same way. They were then put on hinges and set in the frame. Windows were left out at first. Canvas was now stretched over the whole frame and tacked from the back of the middle of the side pieces and tacked while being stretched toward the sides and ends. All of the canvas over the wooden framing itself was now given a heavy coating of warm glue, and the whole thing set to dry. In the meantime the smaller pieces of the "props" were built up. They were then painted to suit each place for which they were designed. They will be plainly seen in detail from the drawings and require little explanation.

The tree was built up of several strips of wood running up the length of the trunk and as near to the edge of the trunk as possible. The whole was then covered with plaster board and painted. A "T" piece of wood was placed across the top of the tree above the front cover curtains and from



PLAN OF SETTING.



The Setting as it Appeared.

there the "leaves" painted on canvas were hung. These pieces of canvas were tacked to the plaster board and all was painted together so that there would be no broken lines. Arms from each side supported the "T" piece and were the limbs shown near the top. The seat around the base was built up and covered with dark cloth.

The glue on the flats was now dry and they were ready for finishing. The canvas was cut around the doors and the rough edges were glued down. It was found that the doors were remarkably stiff and worked well on their hinges. The windows now presented another problem. They were not put in as had been the doors. The glue had set solid around the sides of the opening and so the opening for the window was cut and the rough edges tacked to the inside of the frame around the window. Windows were made separately and of the same general composition as the doors except that no canvases were stretched over them and the cross pieces. After being painted a dark color the frames of the windows did not require glass but were left open. The cloth curtains hung behind them gave the desired effect of the window. They had the added advantge of being light also. They were hinged into the large frames and the flats were then laid out into brickwork, etc. As so little time was left for it, a painter from the city was hired to paint up the brick and door and window frame effects. This was the only work not done by the students of the school. It would have been possible to do this had time been allowed.

The tops of the gas lights on the standards were borrowed and set upon standards made for them. These did well and saved the making of the sheetmetal parts, as no sheetmetal working materials or machines were in the manual arts department.

All fitted together and formed a street and an old apartment house from one of the corners of old London. A "sky" drop which the high school owned was let down in back of these to complete the setting.

ERIE ADOPTS VOCATIONAL EDUCATION PROGRAM.

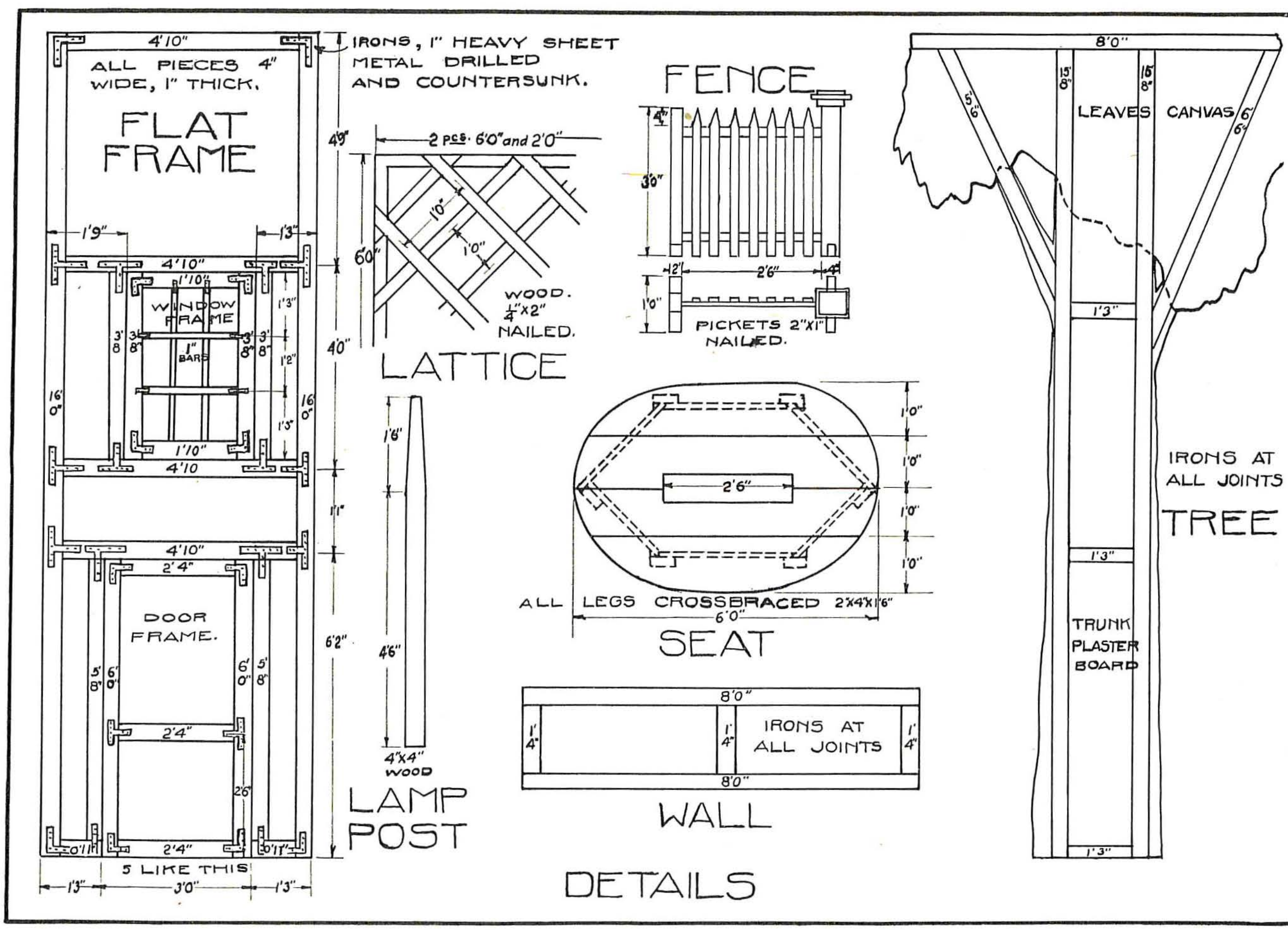
The board of education of Erie, Pa., which has recently adopted a general plan of vocational and industrial training for boys and girls in the public schools, has included in its plan the purchase of property for the conduct of the courses. A lot and building has been purchased which will be used next year for courses in vocational work. School No. 11 is at present being used exclusively for this purpose.

According to the plan, boys are offered a four-year course during which they will devote a total of 2,840 hours to school studies and 5,400 hours as apprentices in Erie shops and factories. With the completion of the course these students will be fully trained tradesmen, with practical and theoretical knowledge.

For girls, there will be a four-year course in household arts, which is to include during the last year a study of commerical law for women.

The complete program for the boys' industrial course is as follows:

First Year—Pupils will devote 1,160 hours to English, algebra and shop mathematics; elementary science, drafting



DETAILS FOR STAGE SETTING.

practice; shopwork, choosing two of the following: wood turning and patternmaking, electric construction, sheet-metal construction and metal working. Five hundred and forty hours will be given to work as trial apprentice in some Erie shop.

Second Year—School work, alternate weeks, English, mathematics as applied to the trade, physics, mechanics and heat, drafting practice and shop theory, totaling 560 hours. Alternate weeks during school time will be given to apprentice work and all of vacation time except two weeks. Boys will spend 2,180 hours in shops, going thru the first and second wage periods.

Third Year—School work, English, mathematics applied to trade, industrial history, drafting practice, physics, electricity and strength of materials, devoting 540 hours. Third and fourth wage periods of fifteen weeks of 54 hours each.

Fourth Year—School time, 580 hours, English, mathematics, industrial history and civics, chemistry, machine design and shop theory. Apprentice time, fifth and sixth wage periods of fifteen weeks of 54 hours each.

Apprentice time may be continued for another year in the case of trades having a four-year requirement, which will not be abated in consideration of the other advantages of the course.

The wage to be paid the pupils will depend on shop conditions, and is yet to be worked out.

For girls the following arts course is established:

First Year—English, elementary science, drawing and design, cookery and sewing, and choice of ancient history, algebra, German or French.

Second Year—English, household physics, sewing advanced, cooking advanced, laundry science, household accounts, drawing and design, and choice of modern history, geometry, French or German.

Third Year—English, household chemistry, drawing and design, home nursing and sanitation, industrial history, advanced sewing, and choice of mathematics, German, French or history.

Fourth Year—English, nutrition (first semester), household management (second semester), millinery (first semester), advanced sewing, civics (first semester), bacteriology (second semester), and commercial law for women (second semester).

UTILIZING WASTE SHEETMETAL.

The economy and conservation campaign which is being made thruout the United States as a war measure has directed attention to the utilization of various apparent waste materials. The accompanying photograph illustrates articles made in the metal shop of the State Normal School of Manual Arts and Home Economics at Santa Barbara, Cal., and is of a type that can be adapted to almost any school.

The articles are made from common tin cans and are the results of a "tin can contest" entered into by the class in sheetmetal under the direction of Mr. N. D. Cook, instructor in sheetmetal work.

A prize was offered for the article showing the best workmanship, design and originality. The prize winner is the oiler with the long spout made from a can of Neatsfoot oil. The can works perfectly as the sides have the requisite spring to permit forcing the oil out. The second places in the contest were awarded to students who made a megaphone from tin can stock and a fine measuring cup with a lip and handle from a tomato can.

In the lower row in the illustration are the following articles from left to right: A radiator filler, flour sifter, a nail stripper for holding box nails in rows, a funnel oil can whose spout afforded a fine problem in triangulation, a drinking fount for small chickens, a scoop, another drinking fountain and flower sprinkler. Hanging next to the dipper is a cookie cutter and at the extreme right is a nutmeg grater. The other articles in the picture are: two match holders, a fruit jar funnel, a square cake tin with loose bottom and two canteens, made as part of the regular course.

The class took much pleasure and derived considerable benefit in making these articles which were in each case made by adding to or taking from empty stock or readily obtained cans. The purpose was to give teachers an idea of the advantages and economies which might be made in using waste tin and which they might pass on with profit to their classes.

Articles made from Waste Sheet Metal.

Dunwoody Institute, Minneapolis, Minn., has added this year to its day school, a baking department exceeding $20,000 in cost. The department includes a bake shop with a capacity of three thousand loaves a day and a complete chemistry laboratory for the teaching of baking and milling chemistry. The school will offer free instruction to students in Minnesota but in the case of outsiders, it is provided that a small tuition fee be required to cover the actual cost of instruction. This fee will be $75 for three months, $125 for six months, and $150 for nine months.

The trade science work has been enlarged in all departments. A power laboratory has been installed where students may be given trade training in the science of steam and electric power and oil and gas engine operation. This course is conducted in addition to the regular electric and automobile work.

A department in sheetmetal work has been added in the day school to meet the needs of sheetmetal employers who desire this training for apprentices in their plants.

Amandus L. Jordon, teacher of manual training, Cleveland, Ohio, First Lieutenant, United States Infantry.

J. Merrill Gray, teacher of manual training, Cleveland Ohio, Second Lieutenant, United States Infantry.

Roy T. Deal, teacher of manual training, Cleveland, Ohio, Second Lieutenant, United States Artillery.

Thomas B. Crigler, teacher of manual training, Cleveland, Ohio, Second Officers' Reserve Camp, Ft. Benjamin Harrison.

Henry F. Schneider, teacher of manual training, Cleveland, Ohio, Quartermaster's Department.

Peter Ryan, teacher of manual training, Cleveland, Ohio, Aviation Corps.

Dale A. Changnon, teacher of manual training, Cleveland, Ohio, Aviation Corps.

F. F. Grince, teacher of manual training, Cleveland, Ohio, United States Infantry.

C. W. Oatland, Green Bay, Wis., National Guard.

F. Van Haaften, Kalamazoo, Mich., United States Engineering Corps.

D. B. Pickett, instructor in manual training, Gracemont, Okla., United States Army.

W. A. Simpson, Niles, O., United States Infantry.

O. W. Hasse, Phillips, Wis., United States Infantry.

Duncan C. Hodges, Grand Rapids, Mich., Second Lieutenant, United States Reserve.

Mr. Arthur Taylor, manual training department, Cincinnati, United States Military Telegraphy.

Major I. Dube, manual training department, Cincinnati, en route Montgomery, Ala.

Mr. Norman Rogers, manual training department, Cincinnati, Captain United States Reserve.

Mr. C. Arthur Schaaf, instructor in manual training, Grand Rapids, Mich., United States Army.

George E. Parsons, teacher of architectural drawing, Mechanic Arts High School, Boston, Captain, 101st Engineers' Corps.

E. E. MacNary, Springfield, Mass., Industrial Education Expert, U. S. Shipping Board.

Ford Chase, Wadsworth, Mass., United States Army.

E. J. Hall, Boston High School of Commerce, Boston, Mass., Plattsburg Training Camp.

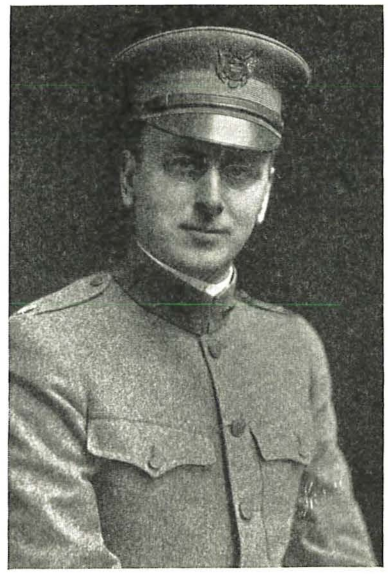
Paul Higner, Urbana, Ind., United States Army.

Glenn Washburn, Princeton, Ind., Aviation Corps.

Mr. Pedler, Lake Forest, Ill., Michigan Reserves.

Robert Hill, Rhinelander, Wis., United States Army.

Frank McKee, Oklahoma City, Okla., United States Army.



WILSON H. HENDERSON,
Major, Sanitary Corps, National Army,
Washington, D. C.

Harry McKimmey, Oklahoma City, Okla., United States Signal Corps.

Emmett Hale, Pryor, Okla., United States Ship Virginia.

Philip H. King, Gorham, Mass., Battery B, First Regiment, Maine H. F. A.

Paul E. Harrison, Polo, Illinois, Hospital Corps attached to Third Illinois, Houston, Tex.

TO ORGANIZE RE-EDUCATION OF WAR CRIPPLES.

The important work of organizing the vocational re-education department of the "reconstruction hospitals" for soldiers, who in the course of the war will become unfitted to return to their former occupations, has been entrusted to Prof. Wilson H. Henderson, Milwaukee Director of the Extension Division of the University of Wisconsin. Mr. Henderson has been granted a commission in the Sanitary Corps of the National Army, with the rank of Major, and will be stationed at Washington. With him will be associated Major W. M. Murray, Principal of the Newton, Mass., Technical High School.

That vocational re-education of crippled soldiers as planned is part of a broad reconstruction program which is to include expert surgeons at the fighting fronts, base hospitals, "reconstruction hospitals," industrial schools and employment bureaus. The purpose is to restore injured men physically and mentally so far as possible and to rehabilitate them for economic independence. Existing schools are to be utilzed so far as possible and the technical schools will be largely called upon for help. The policy of the government will be thoroly democratic and the soldiers will have an opportunity, such as they did not enjoy in youth perhaps, to enter upon a commercial, industrial or professional career.

Major Henderson has been head of the University Extension Division and director of the training course for industrial teachers at Milwaukee during the past two years, and before that was supervisor of vocational education in Hammond, Ind. He has been connected with the vocational education surveys in Minneapolis, Denver, Colorado Springs and St. Paul.

Prof. Fred W. Crawshaw has been appointed as academic dean in the War College which the United States Government is conducting at the University of Illinois.

SENIOR PRINTING CLASS, NORTHERN ILLINOIS STATE NORMAL SCHOOL, DE KALB, ILL.
The picture was taken at the last session in June. All the members of the class enlisted on the following day.

PROBLEMS AND PROJECTS

The Department of Problems and Projects, which is a regular feature of the INDUSTRIAL-ARTS MAGAZINE, aims to present each month a wide variety of class and shop projects in the Industrial Arts.

Readers are invited to submit successful problems and projects. A brief description of constructed problems, not exceeding 250 *words in length, should be accompanied by a good working drawing and a good photograph. The originals of the problems in drawing, design, etc., should be sent.*

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are eligible for consideration.

Drawings and manuscripts should be addressed: The Editors, INDUSTRIAL-ARTS MAGAZINE, Milwaukee, Wis.

AN OLD NEW GAME.

Frank H. Shepherd, Oregcn Agricultural College, Corvallis, Ore.

A few days ago, in conversation with a big jobber who handles toys, novelties, games, and children's goods in general, he informed me that a very large per cent of the toys and games that they are now able to get in this line of trade are made in Japan; that since the beginning of the war in Europe the Japanese are doing the greater part of the business along this line. This jobber further stated that the old games, the games that our grandfathers played when they were little boys, are the ones that are being manufactured and offered for the trade. In support of this statement he showed me a number of toys and games that he had in stock, and among the lot was the old fashioned game of "Battledore and Shuttle-cock."

As a foundation for future experiment I invested 75 cents in one of these games. I think my little boy, who is 5 years of age, has had more than 75 cents' worth of fun and instruction up to this time, and I still have the game for future study and reference.

In connection with the thought of these toys being made in Japan a number of thoughts along the line of "Helping Hoover" have come to my mind. Helping Hoover means so many things—conservation in all its phases; conservation of food, lumber, time, materials of all kinds. Why not conserve some of our waste lumber about the manual training shops, the cords that come wrapped around the groceries, the money that is sent to Japan to pay for the battledore and shuttle-cock game, the profit of the wholesaler, the jobber, and the local dealer, and at the same time work on a project that is full of possibilities for the development of commercial methods in the manual training shops?

Let the teacher read up on the history of the game of battledore and shuttle-cock, make a set for himself, and he will see the possibilities in this very interesting game.

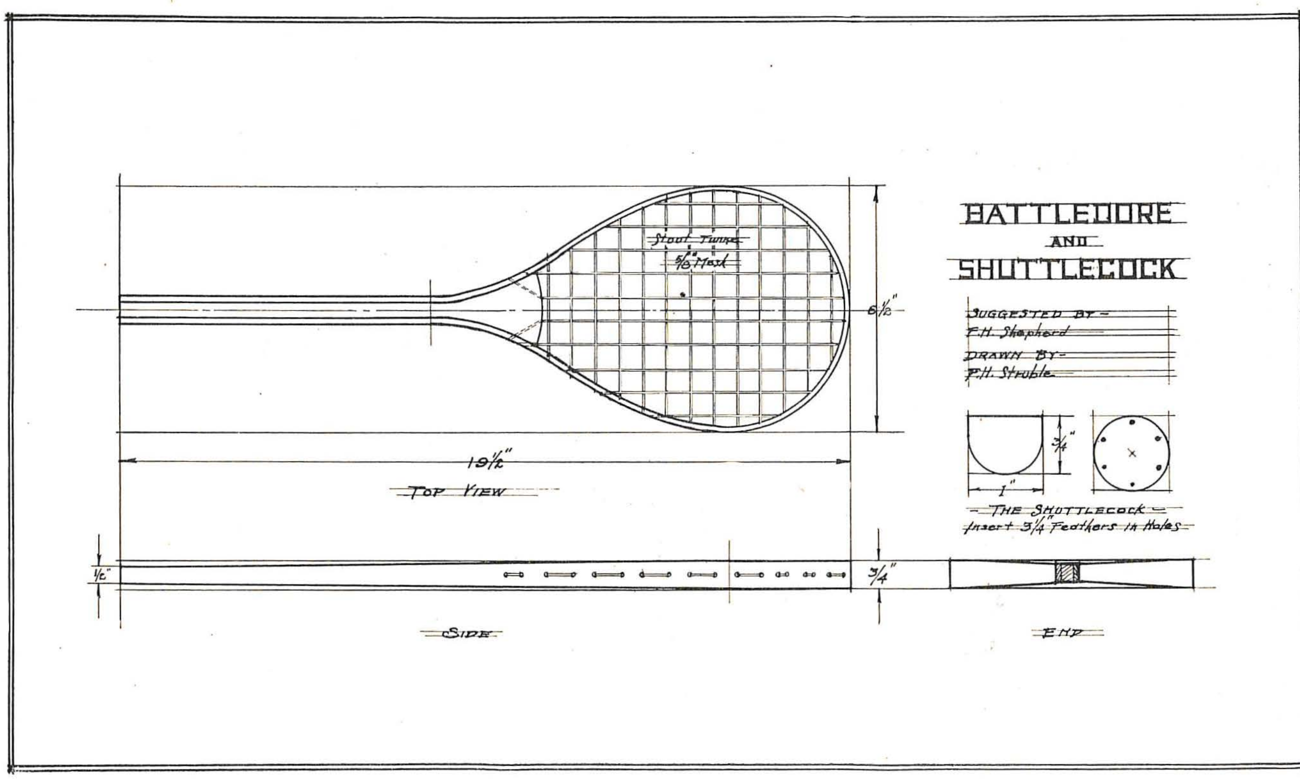
The particular set I bought is made from chestnut. The webbing is common cotton cord or wrapping twine, and without counting time of construction can be made at a cost of less than two cents for the battledore, and practically nothing for the shuttle-cock. The feathers in the shuttle-cock are the stiff wing and tail feathers of the white leghorn chicken, two being white, two being dyed bright blue, and two being bright red. They are approximately four inches long.

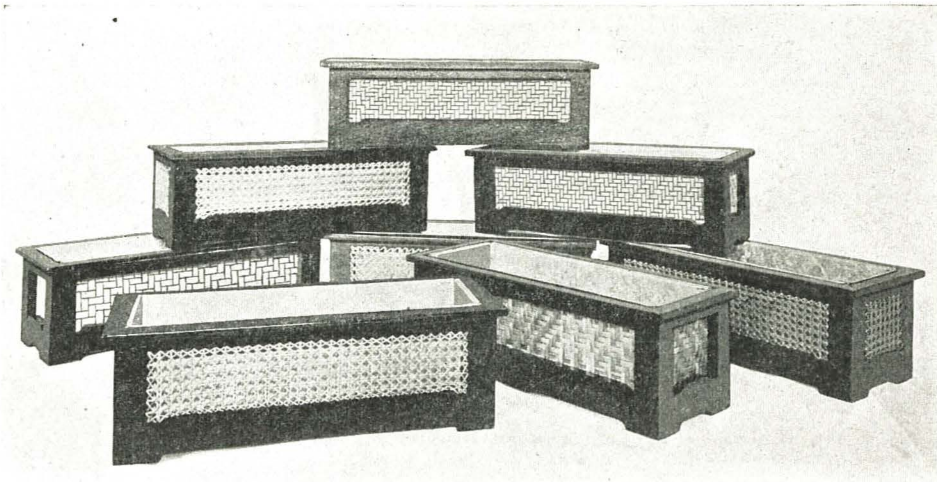
The manual training teacher with initiative can soon construct a steam chest, and use an ordinary teakettle and coal oil lamp, if he has no other means of heating water for furnishing the steam. In the September issue of *The Industrial-Arts Magazine* is an article on "Jigs in Bench Metal Work" that will furnish suggestions for making a jig for bending the frame of the battledore.

This jobber told me that there is going to be a shipload of the battledore and shuttle-cock game sold in the United States before Christmas.

Manual training boys might organize a joint stock company and manufacture battledore and shuttle-cock games as a part of their manual training work. The third-grade pupils could be enlisted to make boxes from bogus paper, pasteboard or tagboard. Another group might cut stencils for decorating these boxes; and still another group in the art division might help them out by the use of water colors. The finished product might be sold and the money invested in a liberty bond or donated to the Red Cross.

In schools where they have printing as a part of the manual training course it would be a splendid exercise to have printed a set of rules for the game or games that may be played with the outfit. A set of these rules should be placed in each box that is sold.





Ferneries Made by Mr. Perry's Students.

FERNERY.

L. Day Perry, Supervisor Manual Training,
Joliet, Ill.

The fernery illustrated is planned for classes of the seventh grade in wood shops. Those illustrated have been made by seventh-grade boys with surprisingly pleasing results. As indicated, the parts are assembled with nails. Butt joints are used, with the exception of the trim, which are mitered. The trim is nailed to the structure.

The centers are cut out with a jig saw. They may be cut with a coping saw if the wood used is not too hard or thick. The ferneries illustrated are made of mahogany, stained, varnished and rubbed. Many are hand-caned and a few have panels of woven hickory splints. Either medium makes an excellent panel in keeping in every particular with the structure.

The cane in this problem requires holes $\frac{1}{8}''$ in diameter, $\frac{1}{2}''$ apart, and employs carriage cane. Hickory splints are most effective if about $\frac{1}{4}''$ wide. Exposed ends of cane and splints in back need no covering of wood strips for they are hidden by the galvanized iron pan. This pan is made with a flange around the upper edge which holds the weight of the pan and its contents. A pan for a fernery this size may be made in a commercial shop for about one dollar.

This problem may be modified materially for advanced classes, both as regards size and method of construction.

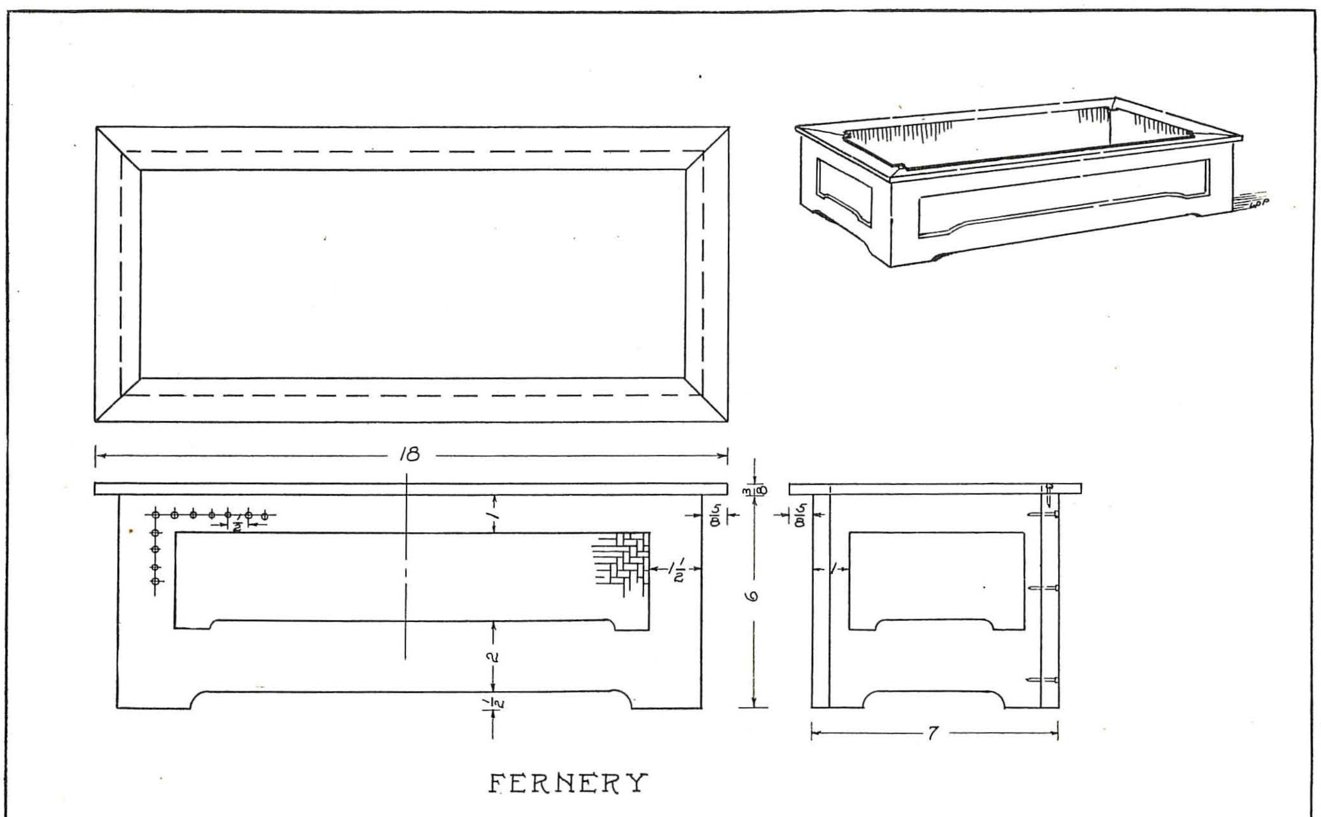
A DRAWING TABLE.

Lawrence O. Swenson, St. Maries, Ida.

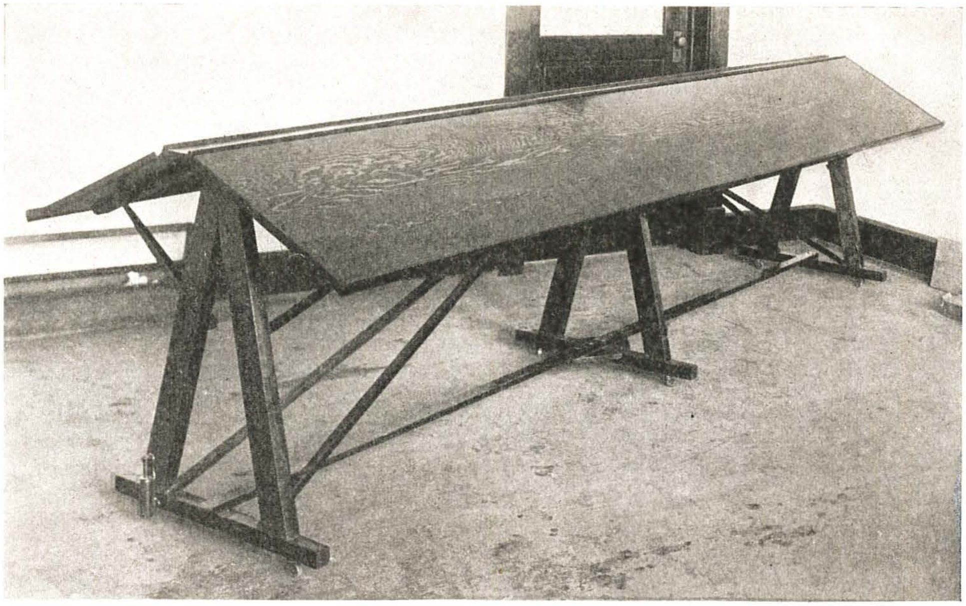
On surveying the Manual Training Department at the opening of school in September, 1915, it became evident that the quarters would be much too crowded. There was but one room 23′ by 53′ in size. Along one side and one end were arranged the work benches. The remaining wall space was taken up with a lumber rack, a cupboard, sink, switch and blackboard, while in the center were placed a saw bench and a planer. This left little or no room for storing purposes or for drawing.

There was no lumber whatever left over from the preceding year, and neither drawing boards nor instruments were to be found. The first thing to be taken up, after organization, in the upper classes was the designing of practical drawing tables for our limited space. Every boy was asked to make sketches suggestive of a table that might take as little room as possible, and one that might be readily shifted about. The table shown in the accompanying cuts is the outgrowth of the general lines suggested by one of the boys, while some of the details were suggested by several of the other sketches.

Two of these tables have been constructed. The material used is Oregon fir, save the arms supporting the hinged sides,



FERNERY



MECHANICAL DRAWING TABLE.

and the cleats screwed to the backs of the sides—which are made of oak. The angles of the frame were secured with the square by the "rise" and "run" method, and formed an interesting and useful high-school exercise. The sides, which are twelve feet long, were jointed by hand, three 8-inch boards being used.

The arms supporting the sides are fastened to the frame with $\frac{1}{4}''$ by 3″ lag screws. The parts of the supports are held together by $2\frac{1}{2}''$ screws. The tables are mounted on castors so as to allow them to be easily moved about. As shown in the photographs each table is provided with a door brake at either end to make it stable when in use. These are operated with the foot. The sides need merely be lifted to close down, allowing the braces to be released.

We deemed it best to stain and varnish the tables, feeling that more pride would be taken in the care of them. Narrow strips of felt were glued to the backs of the drawing boards to prevent the boards from marring the table surface.

A DISK SANDER.

E. A. T. Hapgood, East Orange, N. J.

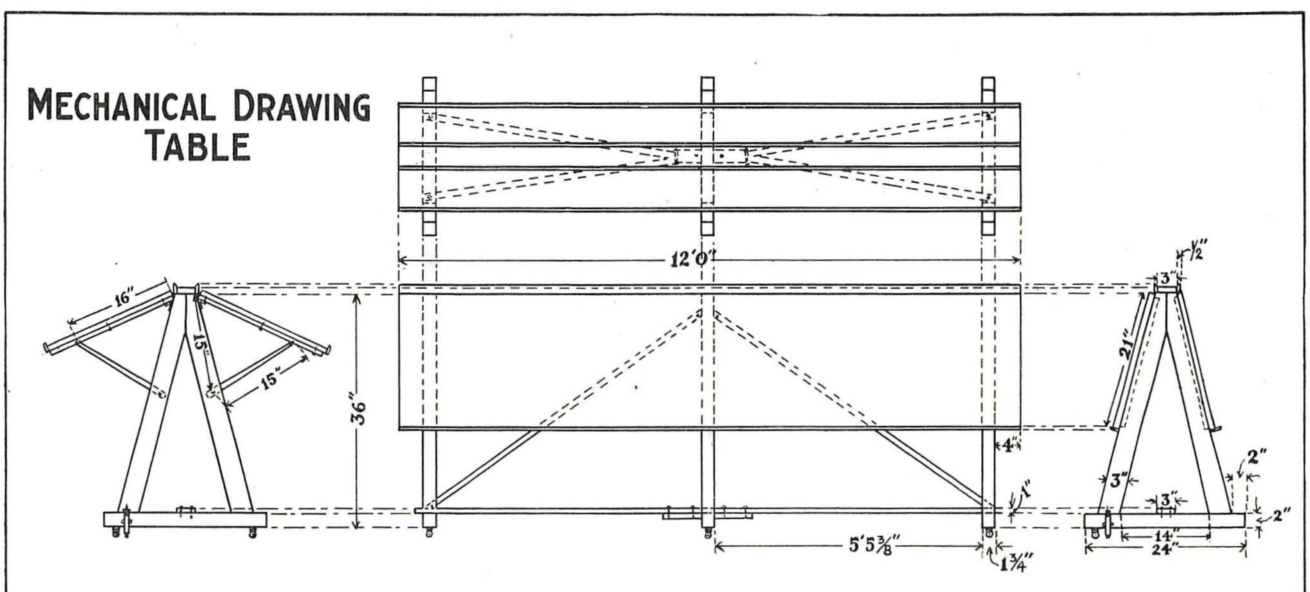
The 12″ disk sander, here shown, was designed and made by some of the boys of the East Orange High School, as the result of a need in the shops. It can be very easily duplicated in any shop where there is an available lathe, and will give practically the same service and satisfaction that a much more expensive machine would. The tilting table, adjustable guide, and method of attaching paper disk are features.

The matter was approached in this manner: Upon receiving an order for several hundred small and similar pieces of work in one of the classes, the opportunity was taken for a discussion of commercial methods for handling such a job, and disk sanders (several makes) among other devices and machines, were described.

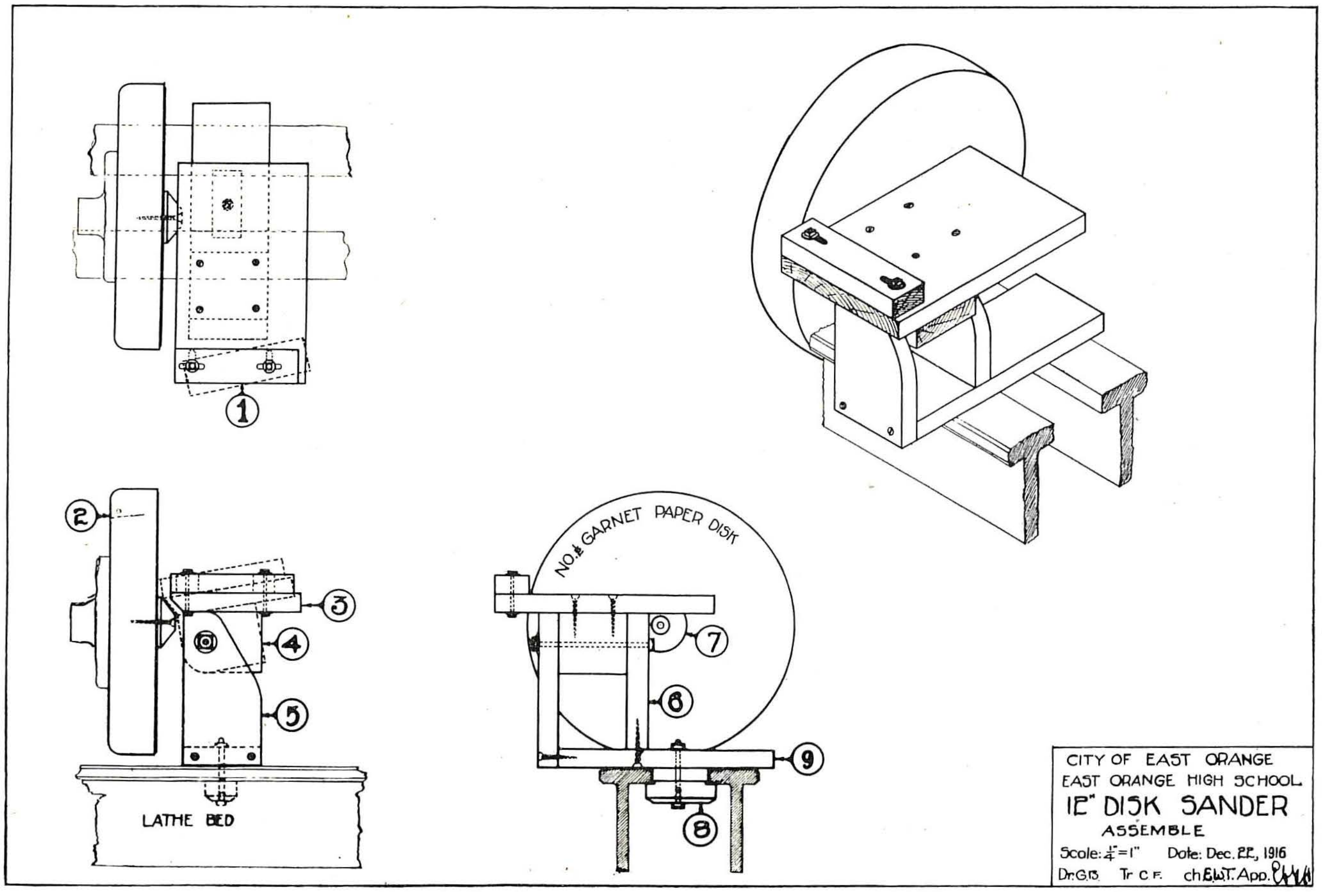
A few of the more ambitious boys were very much interested, and were encouraged to consult commercial catalogs, and utilizing one of the wood turning lathes, to design and make a sander.

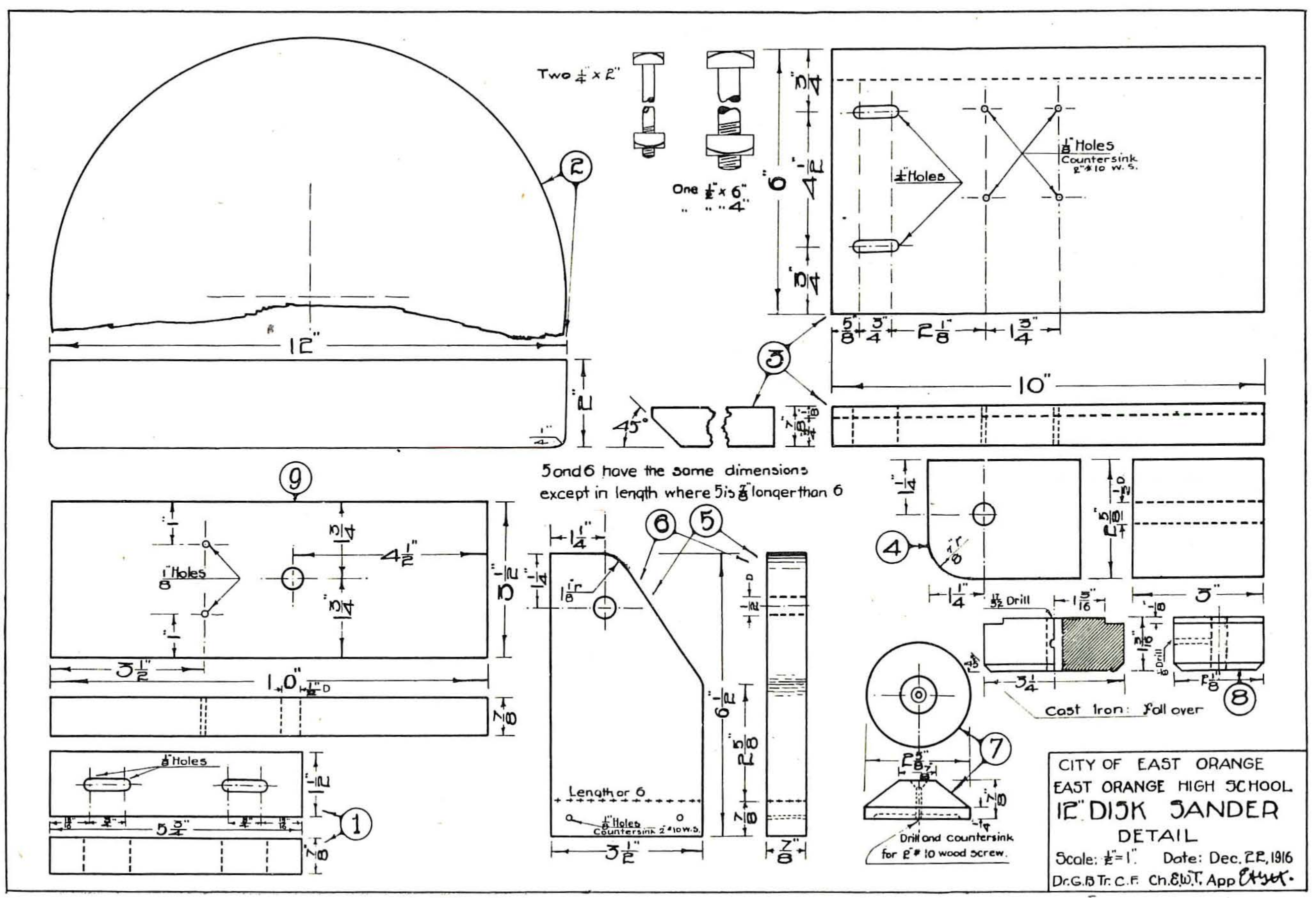
Upon the completion of the project, a fine opportunity presented itself for a discussion of "belt transmission," "speed versus power," etc., in connection with driving the disk.

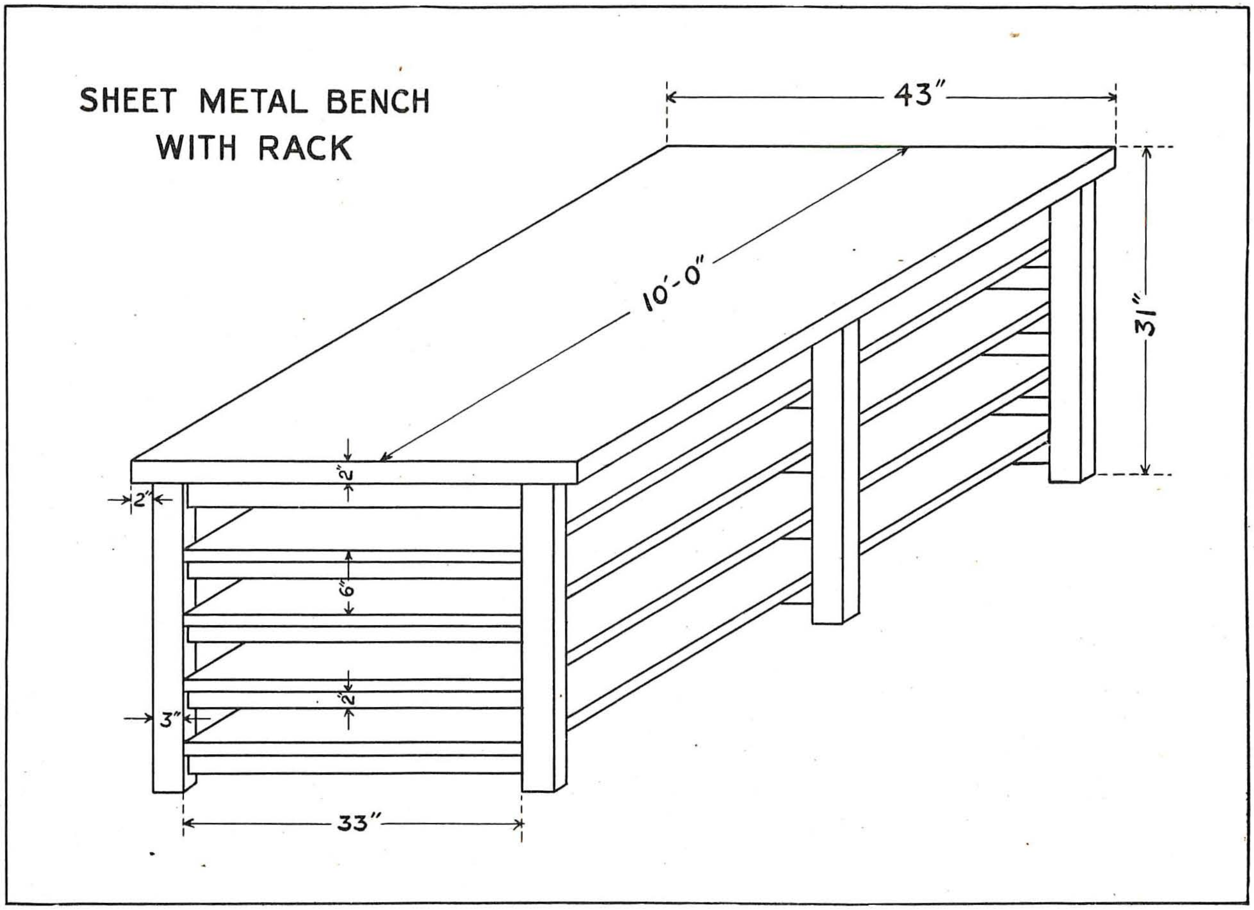
Aside from the utility of this little device in the shop where it was made, the general information gleaned by the class during its design, construction, and use, made it well worth while.



PLAN OF TABLE DESIGNED UNDER MR. SWENSON'S DIRECTION.


1
2
3
4
5
LATHE BED
NO. ½ GARNET PAPER DISK
6
7
8
9
CITY OF EAST ORANGE
EAST ORANGE HIGH SCHOOL
12" DISK SANDER
ASSEMBLE
Scale: ¼" = 1"   Date: Dec. 22, 1916
Dr. G.B. Tr. C.F. ch. E.W.T. App.


2
12"
2"
Two ¼" x 2"
One ½" x 6"
" " " 4"
⅛" Holes
Countersink
¼" Holes
3
10"
45°
9
⅛" Holes
4½"
3½"
1, 0"
5 and 6 have the same dimensions
except in length where 5 is ⅞" longer than 6
6
5
Length of 6
⅛" Holes
Countersink
3½"
4
Drill
Cast Iron: Fall over
8
7
Drill and Countersink
for 2" # 10 wood screw.
1
⅛" Holes
CITY OF EAST ORANGE
EAST ORANGE HIGH SCHOOL
12" DISK SANDER
DETAIL
Scale: ½" = 1"   Date: Dec. 22, 1916
Dr. G.B. Tr. C.F. Ch. E.W.T. App



Details of Bench designed by Mr. H. J. Cox.

A BENCH FOR SHEETMETAL WORK.

Hugh J. Cox, Shop Foreman, Boston Trade School, Roxbury, Mass.

A practical bench for a sheetmetal shop is shown in the accompanying drawing.

The particularly commendable feature about the bench is the shelves or rack for the storage of sheets of galvanized iron, copper and zinc of any size up to and including sheets 32″ wide by 120″ long.

The standard size and most economical size of galvanized iron and copper being 30″ by 96″, it can readily be seen that this size rack will meet all ordinary requirements.

It should be made of maple or oak, and instead of wood to support the shelves as shown in the drawing, a $\frac{3}{4}$″ rod may be used to allow more space between the shelves if needed.

The bench top is 24″ longer than the standard sheets and allow a space on either end to place the tools when not in use. It also allows enough space to accommodate a forming machine or a folder at either end.

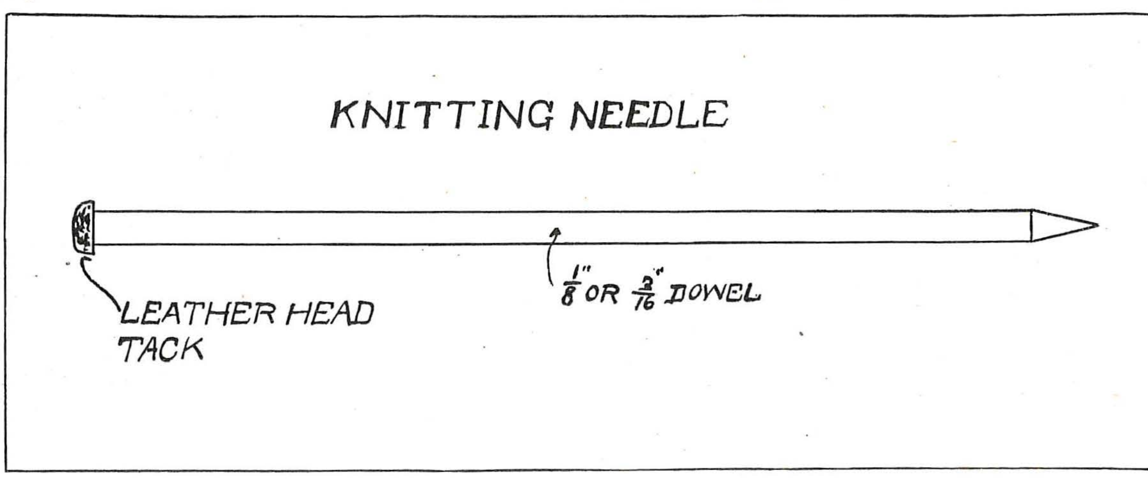
The width of 43″ permits the placing of a number of bench plates 8″ wide along the length of one side without interfering with a 30″ wide sheet.

A RED CROSS KNITTING NEEDLE.

Wm. A. Carter, Public School 90, Richmond Hill, New York City.

At the beginning of the school year the sewing teacher of Public School 90 was confronted with the problem of equipping her girls with needles for knitting Red Cross material. As the supply department of the board of education could not furnish the needles and as they cost about 25 cents per pair, in local stores, the teacher was in a quandary until the writer hit upon the following idea.

One hundred $\frac{3}{16}$-inch dowels were bought and sawed into 12 and 14-inch lengths. One end of each stick was then sharpened with a pencil sharpener. This made all the points the same size and length. The sticks were then thoroly sandpapered and the pointed ends were slightly rounded to remove any danger of splintered tips. The sticks were then given two coats of wax and were rubbed. This made them smooth and slippery. Finally a leather-headed upholstery tack was driven into the square end of each stick and the needles were finished. The dowels cost 65 cents and the tacks 60 cents, so that for $1.25 the school obtained 140 pairs of knitting needles. The needles are doing service in the sixth and seventh-year classes.



NOW, ARE THERE ANY QUESTIONS?

This department is intended for the convenience of subscribers who may have problems which trouble them. The editors will reply to questions, which they feel they can answer, and to other questions they will obtain replies from persons who are competent to answer. Letters must invariably be signed with full name of inquirer. All questions are numbered in the order of their receipt. If an answer is desired by mail, a stamped envelope should be enclosed. The privilege of printing any question and reply is reserved. Address, Industrial-Arts Magazine, Milwaukee, Wis.

Agricultural Problems.

707. Q.—I have "Agricultural Woodwork" by Roehl, and have made a good many things in it, but I would like to have another book of new ideas. I want to make small articles.—*O. H.*

A.—The following books offer problems in Agricultural Woodwork: *Brace and Mayne's Farm Shop Work*, $1.00, American Book Company, Chicago, Ill.; *Blackburn's Problems in Farm Woodwork*, Manual Arts Press, Peoria, Ill.; *Fiske's Poultry Appliances and Handicrafts*, $0.50, Manual Arts Press, Peoria.

Wax Investment.

708. Q.—Will you kindly give me formula for the "Investment" under heading of "A New Process—Waste Wax Castings for Jewelry" mentioned in the September number of the *Industrial-Arts Magazine?—H. F. H.*

A.—The investment mentioned in the article is a fluid preparation of which there are several on the market. I use and after experience with other makes prefer Taggart's Fluid Inlay Investment which is sold by Wm. N. Taggart, 538 S. Clark St., Chicago, at one dollar per box. I do not know the composition, but believe it consists principally of plaster-of-Paris to which has been added some graphite. It may also contain other ingredients.

The wax which I prefer after years of experimenting is the Black Inlay Model Wax made by The S. S. White Dental Mfg. Co. It sells at 37 cents a box.

Both wax and investment are prepared for dental use and can be purchased from any dental supply house.—*Louis J. Haas.*

Banana Oil.

710. Q.—How is banana oil lacquer prepared and applied?—*A. W.*

A.—Banana oil lacquer is usually made of equal parts of amyl acetate, acetone and benzine with a bit of pyroxyline to give it body and to leave a protective covering after the liquids have evaporated. There is no fixed formula and various users seem to change the formula according to their needs. It is applied with a soft brush.

Mission Furniture.

712. Q.—I have a request from a friend for a book on "How to Make Mission Furniture." Can you supply such work?—*R. F.*

A.—Mission or straight-line furniture has not been adequately represented in the literature on furniture design and furniture making. The best books are: *Windsor's Misson Furniture, How to Make It*, $0.50 and $1, Popular Mechanics Co., Chicago; *Stickley's Craftsman Homes*, $2, Craftsman Co., New York; *Crawshaw's Problems in Furniture Making*, $1, Manual Arts Press, Peoria.

Kiln and Air-Dried Lumber.

713. Q.—Will you please advise in regard to using kiln-dried or air-dried lumber in a rather damp cellar when the steam heat is not on? Would the kiln-dried lumber absorb more moisture and cause it to warp and twist more than would the air-dried? This applies only to oak.—*L. N. C.*

A.—This practice will be attended by disastrous results after the material has been completely assembled and finished and subsequently placed in a heated room. This is due to the fact that lumber, either kiln or air dried, tends to absorb enough mositure from the atmosphere until it has increased in weight to about 30 per cent. This is the average normal content of moisture in yard-dried material. When you understand that it is inadvisable to use lumber for cabinet work which contains more than five to seven per cent moisture, you will appreciate the changes which are bound to occur in a table, for instance, which is made and finished from material containing 30 per cent moisture. Shrinkage is bound to occur, therefore, time, money and effort will be saved if this correspondent will wait until the cellar is thoroly dried and then use kiln-dried material for his cabinet work.—*Ralph G. Waring.*

Engineering Magazines.

714. Q.—If you have such data at hand, I would be pleased to have you send me the addresses of several prominent magazines which cover the field of engineering, especially civil engineering.—*R. A. B.*

A.—The two important engineering periodicals are the *Engineering News-Record*, published weekly by the McGraw-Hill Publishing Co., New York, N. Y., $5 yearly; *Engineering Magazine*, published monthly by the Engineering Magazine Co., 140 Nassau St., New York, N. Y., $3 yearly.

Other engineering magazines are *Engineering and Contracting*, published weekly by the Myron C. Clark Publishing Co., 608 S. Dearborn St., Chicago, Ill., $3 yearly; *Cassier's Engineering*, published monthly by the Cassier Magazine Co., 12 W. 31st St., New York, N. Y., $3 yearly.

Engineers are frequently interested also in general publications related to their field of work. Among the most popular magazines are: *American Machinist*, published weekly by the McGraw-Hill Publishing Co., New York, N. Y., $4 yearly; *Power*, published weekly by the McGraw-Hill Publishing Company, New York, N. Y., $2 yearly; *Iron Age*, published weekly by the Iron Age Publishing Co., 239 W. 39th St., New York, N. Y., $5 yearly; *Machinery*, published monthly (price $2), by the Machinery Publishing Co., New York, N. Y.

Correspondence Schools.

715. Q.—I wish a general knowledge of carpentry, such as building a shed, log cabin, bungalow, etc. Do you know of any individual or correspondence school where I could gain this fundamental principle of carpentry thru model building of the above subjects?—*W. L.*

A.—International Correspondence School, Scranton, Pa., American School of Correspondence, Chicago, Ill.

Chip Carving.

720. Q.—Will you please give me the address of some company that publishes a book of instruction in Chip Carving?—*H. V. W.*

A.—*Simmonds' Wood Carving*, (chapter on chip carving), $0.50, Manual Arts Press; *Morse's Chip Carving*, $0.25, Art-Craft Institute, Chicago, Ill.

List of Books.

716. Q.—Send me a list of books on machine shop, sheetmetal work, electrical work (for high schools), printing, forging and pattern making.

Machine Shop Practice.

A.—*Colvin and Stanley's Machine Shop Primer*, $1, McGraw-Hill Co., New York; *Moore's Mechanical Engineering and Machine Shop Practice*, $4, McGraw-Hill Co., New York; *Kaup's Machine Shop Practice*, $1.25, John Wiley & Sons, New York; *Smith's Principles of Machine Work*, $3, Industrial Book and Equipment Co., Indianapolis, Ind.

Sheet Metal Work.

Rose's Modern Sheet Metal Worker's Instructor, $2, Manual Arts Press, Peoria, Ill.; *Atkin's Practical Sheet and Plate Metal Work*, $2, Macmillan Co., New York; *Schubert's Sheet Metal Working*, $3, Manual Arts Press, Peoria, Ill.

Electricity.

Timbie's Essentials of Electricity, $1.25, Manual Arts Press, Peoria, Ill.; *Werwath's First Principles of Electricity*, $1, Electroforce Publ. Co., Milwaukee; *Weber's Electrical Construction*, $1.25, Manual Arts Press, Peoria, Ill.

Printing.

Vaughn's Printing and Bookbinding, $1, Public School Publ. Co., Bloomington, Ill.; *Loomis's Progressive Exercises in Typography*, $1, Taylor-Holden Co., Springfield, Mass.; *McClellan's Practical Typography*, $1.50, Manual Arts Press, Peoria, Ill.; *Henry's Printing*, $1.50, John Wiley & Sons, New York.

Forging.

Googerty's Practical Forging and Art Smithing, $1.08, Bruce Publ. Co., Milwaukee; *Schwarzkopf's Plain and Ornamental Forging*, $1.50, John Wiley & Sons, New York; *Harcourt's Elementary Forge Practice*, $1.50, Stanford University Press., Stanford, Cal.; *Bacon's Forge Practice*, $1.50, John Wiley & Sons, New York; *Ilgen's Forge Practice*, $0.80, American Book Co., New York; *Richards' Forging of Iron and Steel*, $1.50, Manual Arts Press, Peoria, Ill.

Pattern Making.

Wilson's High School Course in Wood Pattern Making, $0.80, M. E. Smith, 1618 7th St., N. W., Washington, D. C.; *Turner and Town's Wood Pattern Making*, $1, Manual Arts Press, Peoria, Ill.; *Barrows' Practical Pattern Making*, $2, N. W. Henley Co., New York; *Willard's Pattern Making*, $1, Manual Arts Press, Peoria, Ill; *Purfield's Wood Pattern Making*, $1.25, Manual Arts Press, Peoria, Ill.; *McKim's Arts of Pattern Making*, $2.50, Manual Arts Press, Peoria; *Crawshaw's Problems in Pattern Making*, $1, Manual Arts Press, Peoria, Ill.

NEW BOOKS.

The Little Pruning Book.

By F. F. Rockwell. Boards, 12 mo, 48 pages. Price 50 cents. Peck, Stow & Wilcox Co., Cleveland, O.

This handy little book will be welcomed by teachers of agriculture and by amateur gardeners. Why, when, where and how to prune is told in terse, untechnical language by an authority in the art. The cutting of flower plants, particularly roses, shrubs, trees, hedges, vines, fruit trees, dwarf fruits, and small fruits is taken up in five brief but surprisingly comprehensive chapters. The amateur will appreciate an additional discussion on right and wrong methods. The book appeals to us as valuable for use as a supplementary text and reference book. It is fully illustrated.

Sheet Metal Work.

By Marion S. Trew and Alfred P. Fletcher. Paper, 30 pages. The Washington Junior High School Press, Rochester, N. Y.

This pamphlet contains a splendid course in elementary sheetmetal work. All the processes, except the three preliminary operations of making a locked seam, are developed thru practical projects. These latter include a seed box, a quart measure, a dust pan,—in all nine household articles. Each project is followed by a set of questions to be developed in a student's notebook.

The Industrial Arts in Elementary Education.

By Leon L. Winslow and August P. Gompf. Boards, octavo, 110 pages. Published by the authors at Bowling Green, O.

The authors of this book hold to the theory that manual training which gives only skill lacks content value as a school subject and fails to produce efficient, thinking workers. As such it is unworthy of recognition and should be replaced by a form of industrial arts study which will familiarize children with industry as an organized body of human experience. They would include in this subject all phases of handwork and industry study which now are known as manual arts, drawing, construction work, etc., as an industrial rather than manual subject. All handwork would be introduced to give a familiarity with industrial materials and processes, thru participation by means of drawing and construction. The authors divide the industries as follows: (1) Stone, Clay and Glass Products; (2) Metals, Machinery and Conveyances; (3) Wood Manufactures; (4) Furs, Leather and Rubber Goods; (5) Chemicals, Oils and Paints; (6) Paper and Paper Products; (7) Books and Printed Products; (8) Textiles and Clothing; (9) Foods; (10) Water, Light and Power. Under each division they present branches of the industries which may be taught in the grades and the high school, and suggest projects which may be worked out in the elementary schools. The projects are arranged by grades and involve the use of a wide variety of materials.

A Vocational Reader.

By Park Pressey, with an introduction by J. Adams Puffer. Cloth, 244 pages. Price, 75 cents. Rand McNally & Company, Chicago and New York.

These selections from current literature present brief stories of achievement, adventures and little known incidents in the lives of great men and women. They are all intended to interest children in the leading profitable occupations.

How to Study.

By George Fillmore Swain. Paper, 65 pages. Price, 25 cents net. McGraw-Hill Book Company, New York.

In the closing paragraph of this booklet the author names four books which the student may read with profit in learning how to study. The recommendation seems entirely superfluous in view of the splendid inspirational and informational discussion which he has prepared. The book takes up in succession the proper mental attitude in study, the necessity of studying understandingly, system in study, mental initiative in study and right habits of work. The book is one we should like to see in the hands of all boys and girls, particularly such as are enrolled in trade schools and technical high schools.

Practical Furniture Making.

Volume Two. By Louis Caldwell Dewey. 95 drawings. Price, $1.25. Dewey Blueprint Company, Denver, Colo.

This book of blueprints contains a wealth of material for the teacher who is seeking problems. Straight lines and simple construction distinguish the seventy designs which range in character and difficulty from a simple footstool to an elaborate typewriter desk.

Printers' Arithmetic.

By Charles L. Woodfield. Cloth, 136 pages. Price, 60 cents, postpaid. The Chicago Typothetae School of Printing, Chicago.

High school, grammar school, primary arithmetics are many. Business arithmetics have already made a place for themselves. "Vocational Mathematics for Girls" is the title of a recent book. In "The Printers' Arithmetic" we have still another specialized effort.

That the first 21 pages are given to a review of fundamental operations in arithmetic is severe criticism upon existing conditions. Work upon spacing, the point, the em, a short method of finding ems, with other technicalities requiring mathematics, then follow. The conditions in the exercises and problems under interest, banking, percentage deal in the main with the business of printing.

NEW PUBLICATIONS.

Agricultural Preparedness and Food Conservation. Prepared by the Committee on Thrift Education of the National Education Association. The most vital question before the nation today is that of Food Conservation and educational leaders everywhere are seeking to know what part the schools should take in helping to solve the problem, and how they can give a more effective trend to education itself. The Committee on Thrift Education which has been studying the problem for the past two years gives, in this bulletin, workable suggestions that will be of service to the schools and that will possibly lead to changes in courses of study.

Home Drying Manual for Vegetables and Fruits for 1917. National Emergency Food Garden Commission, Maryland Building, Washington, D. C. Drying vegetables and fruits for winter use is one of the vital national needs of wartime. As a patriotic duty it should be done in every family. As a means of using the over-abundance of garden produce and of overcoming extravagance it is simple and sure in its results. The pamphlet discusses the three methods of sun-drying, drying by artificial heat and drying by air-blast, gives directions for fruit drying, pickling and storage of vegetables, and includes a time table for blanching and drying.

Home Economics Letter 26, U. S. Bureau of Education, Washington, D. C. Contains a most timely bibliography of material available for teaching food conservation.

Department Store Education. Bulletin No. 9, 1917. By Helen R. Norton. Published by the United States Bureau of Education, Washington, D. C. The present pamphlet represents a history of the Boston School of Salesmanship, the first class in which was conducted in 1905, under the direction of Mrs. Lucinda W. Prince. The aims and methods of the school are clearly stated and the subjects are chosen because of their special fitness for sales people in their daily work.

Executive Training for the Industries. Bulletin No. 8, Series No. 12, May, 1917, of the Carnegie Institute of Technology, Pittsburgh, Pa. Issued by the School of Applied Industries, Carnegie Institute. The booklet describes the work in machinery, patternmaking, forge practice engine construction, heating and ventilation, and printing. Training courses for teachers are maintained which offer practical experience to men capable of teaching manual operations.